Operating & Enjoyment Manual

# C-101™ Series III

## Octave Equalizer and Real Time Spectrum Analyzer

AudioControl®

making good stereo sound better®

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# CONGRATULATIONS!

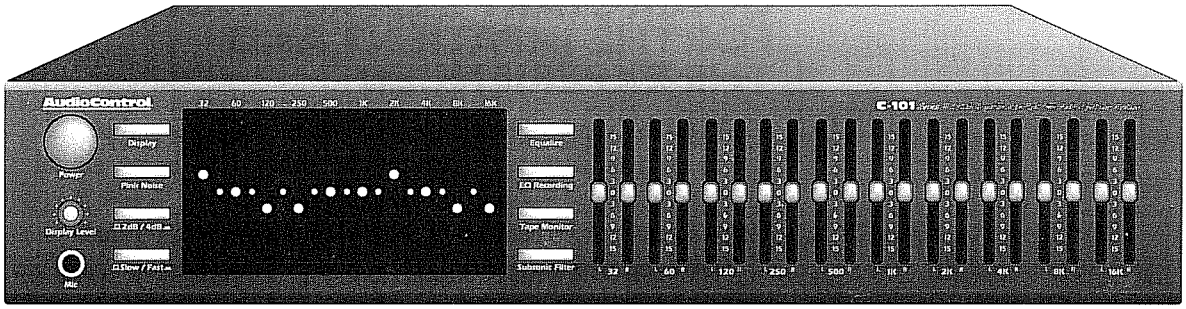
You now own a unique window on the world of sound. The C-101 Series III is a measuring tool, a teaching tool and above all, the key to improving the performance of your stereo system. It's also a heckuva lotta fun to just sit and watch. The C-101 Series III is the third generation of one of the most successful and long-lived American-made stereo components ever offered. While incorporating numerous improvements, the Series III maintains the sonic purity and ease of use that's made the C-101 a classic since 1979.

Your new C-101 Series III is made by the only consumer electronics company in the world that specializes in equalizers, signal processors and spectrum analyzers. And the company whose professional sound division sells the most popular real time analyzer in the world, the SA-3050A. AudioControl's passion for high quality, meticulous attention to detail and pro sound heritage shows itself in the dozens of awards we have won for our designs, products and service. Now, as when we began, our greatest satisfaction is our reputation for sonic excellence and reliability among people just like you throughout the world.

This manual is designed to help you get everything you can out of your new equalizer/analyzer. So, even though you're dying to see it in action, please take twenty minutes or so to slog through our not-so-weighty prose and learn how to get the most from your new C-101 Series III. Anything that has as many lights and buttons as this component deserves all the explanation it can get.

# C-101 SERIES III HIGHLIGHTS

The C-101 Series III combines a distortion-free, octave stereo equalizer and an extremely versatile ten-band analyzer display. Also included is an extremely accurate, laboratory-grade measurement microphone. It allows the display to become a serious diagnostic tool for improving the sound of your speakers and their interaction with the listening environment. The microphone is used in conjunction with an internally-generated test source called a pink noise generator. Because it is used to evaluate acoustics, the pink noise test source must be accurate, as well. The C-101 uses a combination of a triple-source generator and special averaging circuits to eliminate inaccurate output that could affect measurement and real




time analysis. Like the Measurement Microphone, it is "lab grade."

Your new C-101 Series III builds on the proven success of its predecessors with new technology and features.

Internally, it includes a regulated power supply for smoother DC output to internal circuitry, state-of-the-art high-speed integrated circuits for improved transient response and electronic switching. Instead of mechanical switches (which can add noise and extend the signal path all the way through the equalizer), the C-101 Series III uses electronic switches which relay the switching command to circuitry at the rear of the equalizer. This keeps all critical conductor runs extremely short and at the back of the chassis where the input and output connections are. Only the equalizer sliders extend to the front of the unit. For example, when you press the front panel BYPASS switch, it sends a command to circuitry adjacent to the C-101's main input and output jacks which electronically changes the signal path. The music only makes a 4-inch "trip" in and out, instead of wending its way through complex internal wiring.

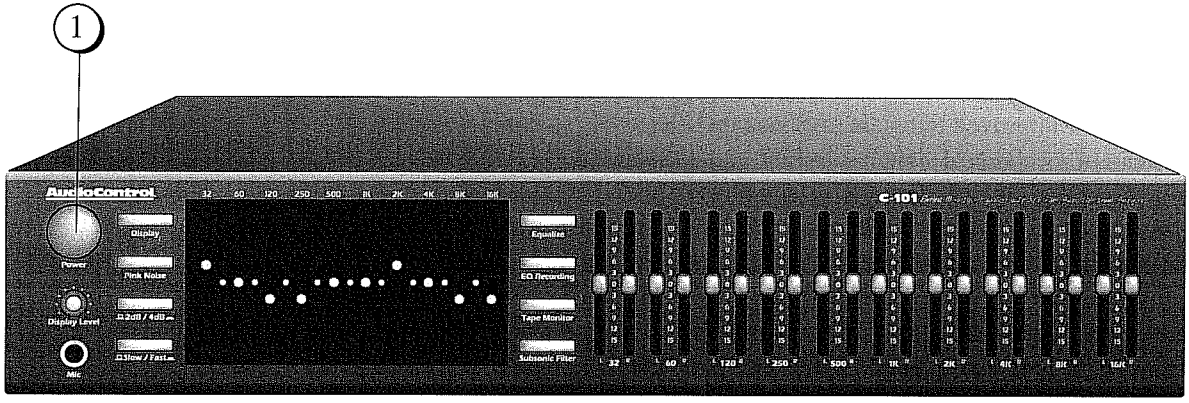
On the Series III's front panel, you'll notice that the analyzer display is slightly closer to the centerline of the unit, making it more visible in deep stereo cabinets. We've incorporated a DISPLAY DISABLE switch (to temporarily extinguish the C-101's dancing light show), microphone jack (so you don't have to fumble around behind the equalizer), EQ RECORDING switch, and interior decorator-approved orange LED line across the center of the display.

Rear panel changes include RCA sockets with gold-plated center pins and a level control for the C-101's pink noise test source. By popular request, it has been incorporated into the main outputs instead of having its own set of AUX outputs.

# QUICK START INSTRUCTIONS FOR THE IMPATIENT AND THE EXPERIENCED

If you've connected equalizers into stereo systems before, distain manuals, and are excruciatingly impatient — or any combination of the above — skip to the drawings on pages 24 and 25. These cover the two most common C-101 Series III hook-ups.

However, we strongly suggest you read the section on Room and System Analysis. While analysis with the C-101 is not difficult, it does require some specific steps in order to insure accurate measurement and effective response smoothing.



# A GUIDED TOUR OF THE C-101 SERIES III

## A. FRONT PANEL

### POWER Button

Push the big round button (1) to turn the C-101 Series III on and off. Because the C-101 only draws 10 watts of power, it can also be switched from a master POWER switch on your preamplifier or receiver (See page 23). If you use this approach, the C-101's POWER button can be left on at all times.

### Equalizer Section

As noted before, the C-101 Series III is really two components in one: An analyzer and an equalizer. The equalizer portion is by far the most bewildering, with its twenty sliders and numerous buttons. However, this electronic centipede is quite easy to tame once you understand a little bit about equalization.

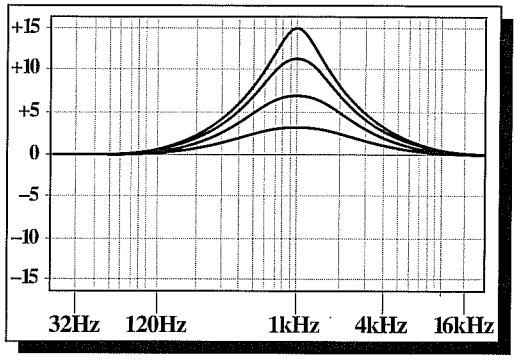
**SLIDERS.** The ten sets of slide controls on the right side of C-101 are used to boost or reduce segments of the audio spectrum. Unlike many other equalizer designs, the C-101 Series III's left and right stereo channel sliders are grouped in pairs next to each other, rather than being separated on opposite ends of unit. There are some distinct advantages to this configuration.

Each set of left/right sliders adjusts one tenth of the audible sound spectrum. The number below each group signifies the frequency at the center of an octave. Frequently this number is referred to as the band center (see sidebar at left).

Notice that all ten sets of sliders are calibrated with markings that extend in 3dB increments from 0 in the center to 15 at the top and bottom. Moving a slider up BOOSTS the frequencies in that octave (Figure 2A); moving it down below the center detent (click) CUTS the sound energy in this octave (Figure 2B).

Figure 3 on page 11 shows where common pop and classical instruments fall within the sound spectrum — and the corresponding

*Figure 2A Boosts at 1,000Hz (1KHz)*



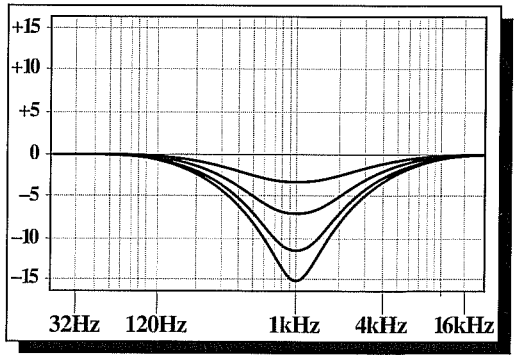




*Figure 2B Cuts at 1,000Hz (1KHz)*

## OF OCTAVES AND FREQUENCIES

Sound is air compressing into waves. How close together these waves are determines how high or low-pitched the sound is. In audio, we express pitch in increments called *Hertz*, or cycles per second. Hertz is abbreviated *Hz*; thousands of Hertz (*kiloHertz*) are abbreviated *KHz*.

A cymbal's crisp treble sounds occur at the high end of the frequency spectrum: 10,000 to 20,000 Hertz. Most adult's hearing diminishes rapidly above 16,000 so we consider this the top end of the spectrum.

A bass drum's low thud sounds between 30 to 200 Hertz on the very low end of the audio spectrum. We consider 30 cycles about the lowest reproducible sound possible, and the low end of the hearing range. Audiophiles will dispute this, but there are precious few speakers that even achieve meaningful output at 30Hz, much less at frequencies below.

In between falls every musical sound you hear.

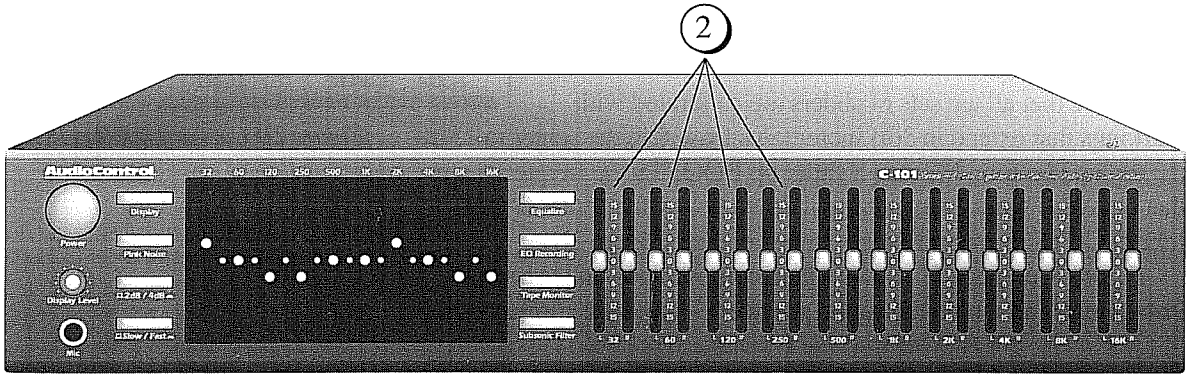
This, then, is the "audio spectrum" we keep talking about: a band from 30 to 16kHz which encompasses the maximum range of human hearing. Needless to say, all music falls within this range. And so the function of an equalizer is to divide this spectrum up into ten equal parts so that you can make adjustments.

Now comes the slightly confusing part. If this is a continuous band about 16,000Hz wide, it would seem logical that when it was divided into ten equal parts, each would each contain 1,600 Hz. So why don't the numbers under the C-101's faders increase in nice equal, linear increments...for example, 1,600 / 3,200 / 4,800 / 6,400 / 8,000 / 9,600/ 11,200 / 12,800 / 14,400 and 16,000?

Because musical octaves don't behave that way. For a note to sound an octave higher than another, its frequency must be double. Thus each octave division in the sound spectrum is exactly twice the frequency of the previous one. This explains why the frequency band centers on the C-101 Series III appear to be irregular, but are actually octave divisions: 32 / 60 / 120 / 250 / 500 / 1K / 2K / 4K / 8K and 16K (16,000Hz)). Notice that each number is approximately double the previous number.

Each of these ten bands contains an equal amount of the frequency spectrum. In other words, 60Hz to 120Hz is one octave, and 8,000 to 16,000z is also one octave.

Though a "Hertz" is a linear increment, frequency response is logarithmic. Thus a single "Hertz" has different significance depending on what part of the frequency spectrum we're talking about. If a new, whizbang speaker claims to extend frequency response twenty hertz in the ultra-low bass range, this is an impressive amount — possibly over an octave. But if the speaker extends high treble response twenty hertz, it's an insignificant amount — since high treble octaves are 4,000, 8000 and 16,000 hertz wide, respectively. This concludes the lecture. It WILL count on your final test.

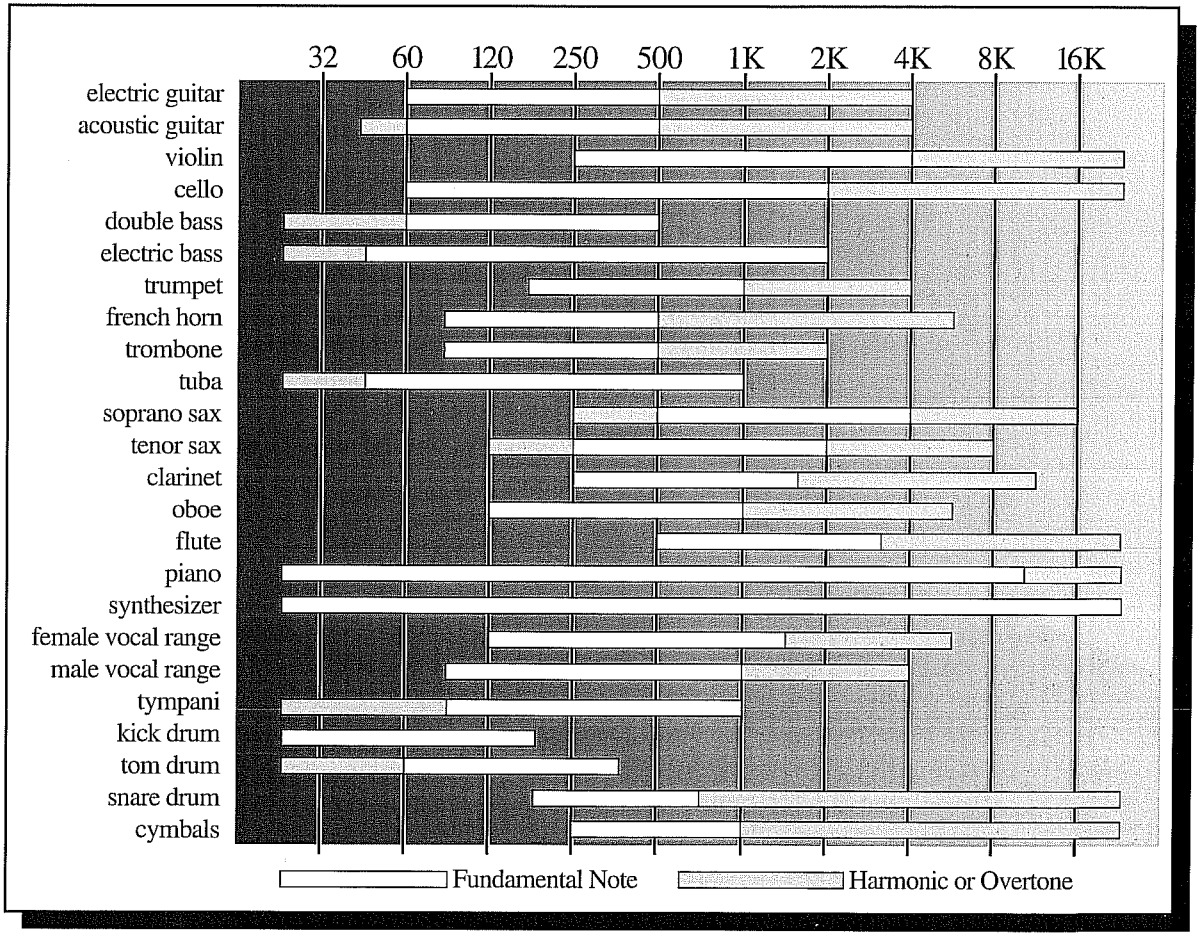


C-101 Series III sliders correspond. Think of it as a chart of what you can control now that you have an equalizer...AND what you'll see on the analyzer section.

**BASS CONTROLS (2).** The four low frequency sliders on your C-101 Series III are an expanded version of the bass control on preamps and receivers. Instead of a single knob, you now have control over four individual octaves, each of which has quite different characteristics.

*32Hz.* This lowest of lows, the frequencies that you feel more than hear. They are critical to reproducing live music, but are also the hardest to reproduce. In fact, the whole recording and music

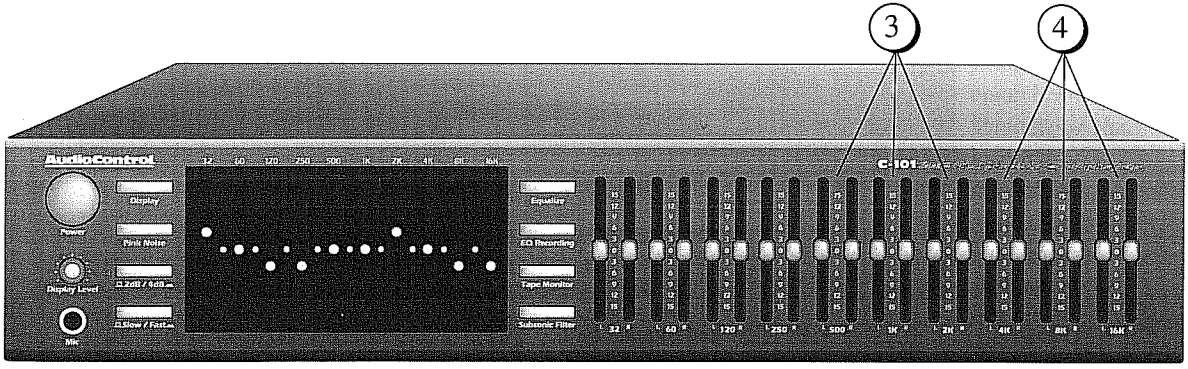
***Figure 3***
*Frequency distribution of common musical instruments*



reproduction process conspires to reduce it. Even $5000 microphones don't have flat response at 32Hz; digital recorders that are flat at 32Hz have only been in wide use since the late '80's and still aren't used for most pop recordings; only digital recordings are flat at 32Hz (cassettes, however, have very little bass under 60Hz). Finally, only the most expensive and/or gigantic loudspeakers can hope to reproduce this frequency with any intensity. Bottom line: There isn't much to reproduce and it's hard for loudspeakers to reproduce what there is. But this lowest musical octave is very important, since it gives music its fundamental, underlying foundation. We don't recommend experimenting with the C-101 Series III's 32Hz sliders until you've done some analysis of the room and your speakers.

*60Hz.* Here's the bass you THOUGHT was deep bass. It's what you get more of when you press a receiver's "LOUDNESS" button or turn up the bass tone control. It's the deep, tight, strong bass that makes rock solid and gives dance music its kick. Increasing the octave centered on 60Hz can make bass drums and floor toms "bigger" and broaden bass guitar parts. It can also enhance bass and baritone male voices. If your loudspeakers are up to it (i.e. have enough woofer surface area and in/out cone travel), they can reproduce a considerable amount of 60Hz bass. However, it takes a correspondingly large amount of amplifier power to do so. More on this later.

*120Hz.* If 60Hz is the "substance" of bass, then 120Hz can be considered the "texture." This is the bass that juke boxes and cheap stereos specialize in. It's the "bass" you hear over a 20-inch TV that



has one or two little speakers. 120Hz tends to have boomy quality that can get very tiresome to the ears after a while..yet it is an essential part of all types of music (except maybe Inca Nose Flute recordings). You can prove this by reducing the C-101 Series III's 120Hz sliders to -15Hz while playing a pop, rock, jazz or symphony track. You'll discover that a lot of what you might have thought was bass will be gone. Now boost the slider to +10. Sounds "really bassy" for just a few minutes until your ears begin to feel like they've been kicked around by a professional wrestler. To further refine our analogy, if 32Hz and 60Hz were the flour and eggs of a cake, the 120Hz band is the vanilla extract and sugar - the flavoring of bass. Boosting it too high is like guzzling straight extract and sugar syrup. Use 120Hz sparingly, as a seasoning, the way album producers do: Maybe +3 to pump up a vocal or a bass guitar part. A bit more if you're a drum freak. Also good for acoustic bass, virtually all symphonic music and your Aunt Tillie's goiter. 250Hz is sort of a transition area between bass and midrange. Many instruments are affected by boosting or cutting it as you can see in Figure 2. Most often this slider is adjusted as part of an overall curve, involving the 120Hz and 500Hz faders as well.

***"The first thing that music must understand is that there are two kinds of music — good music and bad music. Good music is what I want to hear. Bad music is what I don't want to hear."***

*Fran Lebowitz*

**MIDRANGE (3).** The 500, 1K and 2K sliders control the core of music. Melody instruments, vocals, mid-range percussion - almost everything we associate with melody and rhythm. With care, you can substantially change the sound of most melody instruments as well as vocals. 500Hz adds substance to male voices, brass, hollow-body electric guitars and often, solo piano. In our experience the 1K slider does the most for all-around human voice presence — you can actually use it to make indistinct vocals more understandable. Our ears are most sensitive to the octave centered at 2KHz. Reducing it can prevent ear fatigue; boosting it will add immediacy, presence and "attack." Because there seems to be quite enough midrange in most rock and pop music (and virtually all speakers excel in creating midrange), you'll probably find yourself reducing the 500, 1K and 2K midrange octaves more often than you will boost them.

**TREBLE (4).** 4K, 8K and 16K are the "frosting" in our musical cake analogy. Oddly enough, these aren't the frequencies that cause you to say "ouch!" and turn down your stereo. What you thought

***"When you are about thirty-five years old, something terrible always happens to music."***

*Steve Race*

was tinny treble is far more likely to be sounds in the high midrange, particularly the octave around 2KHz. Adjusting the 4K slider will affect the brightness and clarity of many instruments including strings, woodwinds, acoustic guitar and piano. Up at 8K you'll be surprised how few instruments are actually affected...the tips of women's vocals, snare drums, some synthesizer and higher brass and woodwinds. But you can boost it more than you might first suppose by its classification as "treble". 16KHz gives musical instruments their "air", openness and fine details such as the crisp sizzling of cymbals, the high harmonic overtones of a solo violin or, the breathy immediacy of a closely-miked female vocal. This is also the frequency range that involves (dare we bring it up?) your age. From young adolescence on we start to lose the high end of our hearing. It's old Father Time at work, slowly reducing your hearing from 20kHz to 18kHz and then lower depending on your age, sex and number of Megadeath concerts you've attended. Not that we're saying you are getting deaf when you reach thirty or forty. But you're hearing less 16K than you could ten years ago (even though there's more 16.5kHz treble in compact discs and newer cassettes than there was a decade ago). If you don't opt for vainness and leave this control alone, boosting it slightly can extend the high end of your hearing curve again, bringing out a lot of fine musical details. 16kHz is also challenging for many loudspeakers: Most can produce it, but less can disperse it as widely as is necessary for accurate music reproduction. Using the C-101 Series III's analyzer section, Measurement Microphone and pink noise test source, you'll be able to see just how well your speakers do.

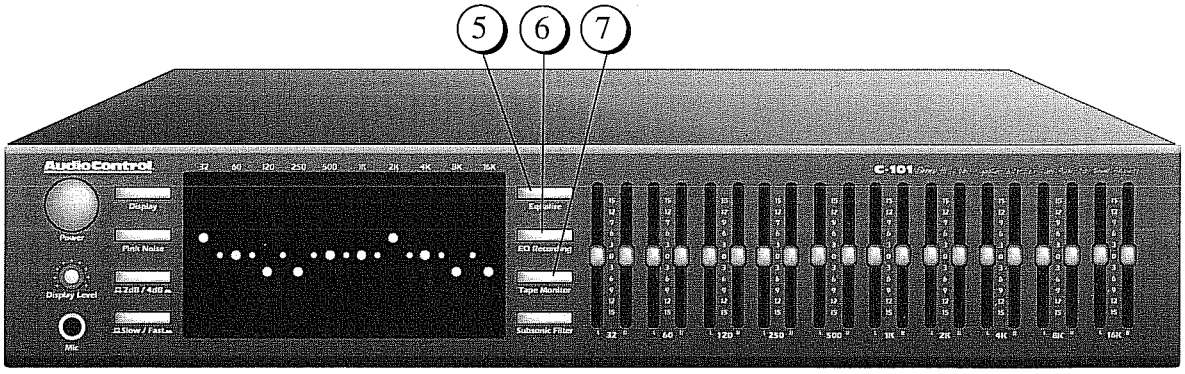
**EQUALIZE (5).** This switch activates the equalizer section of the C-101 Series III. Think of it as a sort of a "Before and After" button. You can make adjustments with the equalizer sliders and then compare your settings to "normal." This is especially valuable when you're first experimenting with equalization and need to frequently compare the effect of your settings versus no equalization. Even most recording engineers use this comparison constantly when adjusting equalization in the studio...so it's valid to use the EQUALIZE button frequently if you're adjusting sliders. Its also valuable for impressing your friends by showing them just how much better your system sounds with some careful equalization.

**EQ RECORDING (6).** This button lets you add equalization adjustments to tapes while you record them. If you record your own tapes, the C-101 Series III's ability to let you custom-equalize and enhance your homemade cassettes can be extremely valuable. Car tapes, tapes for "boom boxes" and for personal portable tape players can all benefit by different equalization curves. We suggest some in Appendix A on page 41 of this manual.

**TAPE MONITOR (7).** This button has several purposes. First, it duplicates the Tape Monitor loop on your preamplifier or receiver so that you can connect other components THROUGH the C-101 Series III. A tape monitor loop is just that: a loop that routes a signal out of one component to another and then back to the first component. This button will be used when you use the C-101's analyzer section or if you have connected a cassette deck or other sound enhancer to the C-101's rear panel TAPE inputs and outputs (This will become more understandable when we cover hook-up later on.)

Second, if you have a three-head cassette deck, you can actually monitor the tape as it is being made and judge the effect of your equalization adjustments. Simply press the TAPE MONITOR button in to its TAPE position while recording.

Third, TAPE MONITOR is potentially a great way to get really frustrated if you're not careful. If you don't connect anything to the C-101's TAPE connections and then press this button, your stereo system will become magically silent, since the signal is being routed OUT, but not back INTO the C-101. We get a lot of calls from people whose stereo's "won't work" but can be magically cured by

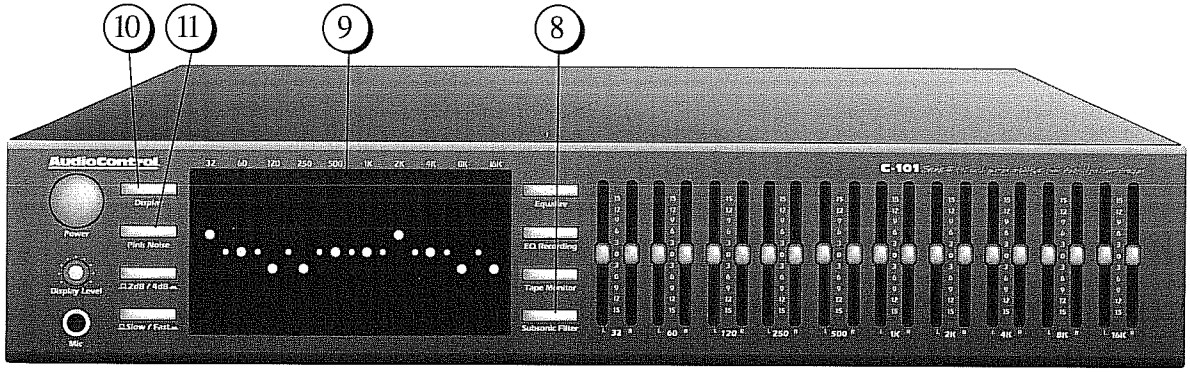


leaving the TAPE MONITOR button in the OUT (PROGRAM) position.

**SUBSONIC FILTER (8).** What's a subsonic and why would you want to filter them? Subsonics are just what their name implies: Sounds BELOW the range of human hearing. As already noted, few speakers can even reproduce 32Hz notes. Subsonics range from 25Hz to 1Hz. They add nothing to music but put a terrific strain on your loudspeakers and power amplifier. You can actually SEE subsonics as visible movements of a speaker's woofer cone. Since the speaker is trying to reproduce sounds you don't hear, it can distort sounds you DO hear (intermodulation and Doppler distortion), especially in a two-way system where the woofer is also handling some of the mid-range chores. In extreme cases with powerful amplifiers, subsonics can actually damage woofers through over excursion of the cone.

When we wrote the original C-101 Series *I* manual, we noted that subsonics were caused by "*...warped records, turntable rumble, the thump made when a tone arm is lifted off the record, or the feedback caused by placing a turntable close to the speakers...*" Now that vinyl has gone the way of the buggy whip for most of us, you'd think that subsonics would have too. But this isn't the case. Surprisingly enough, the output of many CD players and cassette decks CAN and DO contain subsonic frequencies (notice how tactfully we put that so as not to pin blame solely on record labels or stereo component manufacturers?).

Cutting to the chase, if you still play records, subsonics are a real



problem; if you play only CDs and tapes, trust us, subsonics continue to detract from system performance even though they theoretically shouldn't exist with these media. In either case, what you need is a good subsonic FILTER!

The AudioControl C-101 Series III features a sophisticated 3-pole, 18dB per octave subsonic filter. It sharply chops off frequency response under 25Hz without sapping audible pass or causing phase distortion. Unless you have a compelling reason to do otherwise, leave the SUBSONIC FILTER button IN. You may find that the bass response of your system will sound more solid. Nothing ventured, nothing gained.

*NOTE: Unlike oil filters, dryer filters and furnace filters, the C-101 Series III's subsonic filter never needs to be removed for cleaning.*

***"Music above all, and for this Prefer an uneven rhythm."***

*Jadis et Naguére*

## Analyzer Section

If the theme of the C-101 Series III's equalizer section is "control," the analyzer section represents "measurement." It provides a visual display of the same ten octave bands.

**LED DISPLAY (9).** The analyzer display is a visual counterpart of the equalizer. Each column of nine red LEDs (light emitting diodes) corresponds to a band of the frequency spectrum. The "quantity" of each band is represented by the number of LEDs that are on at any given moment. In effect, the display is a bar-graph read-out of the frequency spectrum. When a particular frequency range is present in the musical selection, the "bar graph" grows.

A horizontal line of amber LEDs appears through the center of the display to provide a reference against which to base equalizer adjustments. Two sets of vertical calibrations provide a numerical reference.

**DISPLAY button (10).** This switch turns the LED display on and off. Frankly, we advocate leaving it pressed in so that the LED display shows the constantly changing frequency content of music. However, if you think it's distracting, it can be left in the OUT position except when doing real time analysis.

**PINK NOISE (11).** During normal operation, this button is left in the OUT position. The only time it is used is when you are doing real time audio analysis. Pressing PINK NOISE activates the Series

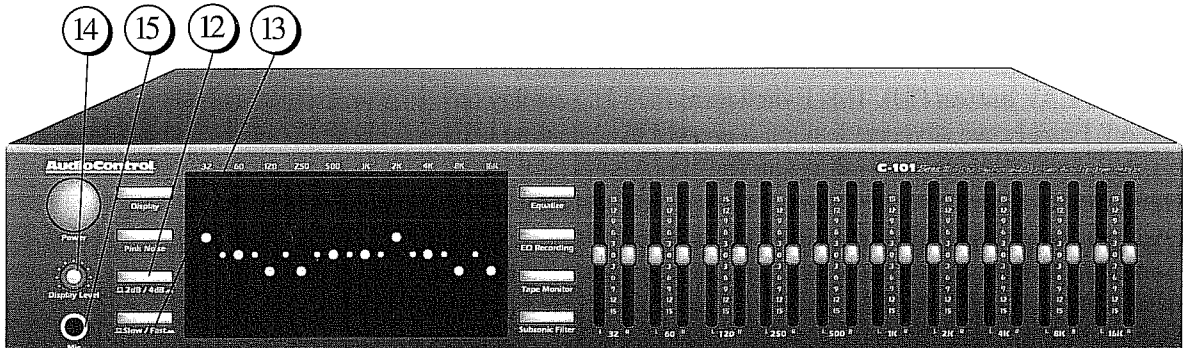
III's pink noise generator, which sends a test tone through the C-101's main outputs to your receiver and ultimately the speakers.

First, what the heck is pink noise? It sounds like the hiss that is between FM stations but deeper. Pink noise is random noise with equal energy per octave of sound. So, if pink noise has equal energy across the entire audio spectrum, it will theoretically appear as a flat line on a spectrum analyzer display. This is where the term "flat response" comes. When the test source is "flat" and the speakers, tape deck, preamplifier or such make no boosts or cuts (only in a perfect world), the speakers' output also should be "flat." This is the essence of how real time analysis works and will be covered in depth later in this manual.

**2dB / 4dB (12).** Music varies considerably in its dynamic range (volume from soft to loud). Some pop music (and most FM stations regardless of format) are compressed so that they're basically the same loudness at all times. Many orchestral pieces, on the other hand, range from barely audible to thunderous. Because music, as well as digital media such as compact discs are capable of varying ranges of dynamics, we have provided two different display ranges.

Think of the LEDs in the C-101 Series III's display as marks on a ruler. To measure a wider range, we couldn't add more LEDs; instead we gave you a button to "stretch" or "shrink" the ruler. It has the same number of marks, but, depending on the position of the RANGE button, each mark can represent two different ranges.

1. The 4-dB (IN) position covers the widest range. It has application analyzing music with a wide dynamic range (such as



compact discs, DAT recordings, etc.) or for making the first rough room equalization measurements during real time analysis.

2. The 2-dB (OUT) position "zooms in" to focus on a smaller range. It is for making final room equalization measurements, or for analyzing older analog recordings that have less dynamic range.

**SLOW / FAST (13).** The frequency content of music changes constantly. If the C-101 Series III's display showed changes at the speed they occur, all you'd see would be a flickering blur. Instead, it employs averaging circuitry that slows down and summarizes frequency changes so that the human eye can comprehend them. Two display speeds are offered via the DISPLAY ACTION button.

***"Just as my fingers on these keys, Make music, so the self-same sound, On my spirit makes a music, too."***

*Wallace Stevens*

A. SLOW mode (OUT position) is used for making room equalization measurements. Circuitry averages small changes in frequency content and leaves each LED on longer. SLOW mode is primarily used during real time analysis or extremely dull cocktail parties.

B. FAST mode (IN position) mirrors more accurately what is going on in music at any given instant. It's also there to impress friends, hypnotize your parakeet, and to learn a tremendous amount about sound frequencies and equalization.

The rotary **DISPLAY LEVEL knob (14)** has two functions.

1. During normal operation, it can be used to "center" the display on the screen. Music that is extremely quiet may not register on the C-101 Series III's LED display — it's basically "happening" below the range of the LEDs. The DISPLAY LEVEL knob can "turn up" the volume reaching the C-101 so that the music's frequency make-up will register on the display.
2. DISPLAY LEVEL is also used during real time analysis (see page 31).

**MIC (15).** Here is where you plug in the AudioControl Measurement Microphone used for real time analysis.

The AudioControl Microphone is a precision, non-directional, condenser design that is intended only for the measurement of acoustics. It has a very flat response and has been painstakingly

designed to give the very best possible results with the C-101 Series III..

*NOTE: The AudioControl Measurement Microphone is for use ONLY with the AudioControl C-101 Series III Equalizer/Analyzer. Do not attempt to use it for voice or music recording, or with any other phone jack input on tape decks or receivers.*

**IMPORTANT: Never plug any microphone other than the AudioControl Measurement Microphone into this socket. It is possible that you could damage other microphones by connecting them to this receptacle.**

**CRITICALLY IMPORTANT: At all times, keep the AudioControl Measurement Microphone away from teething Rotweiller puppies.**

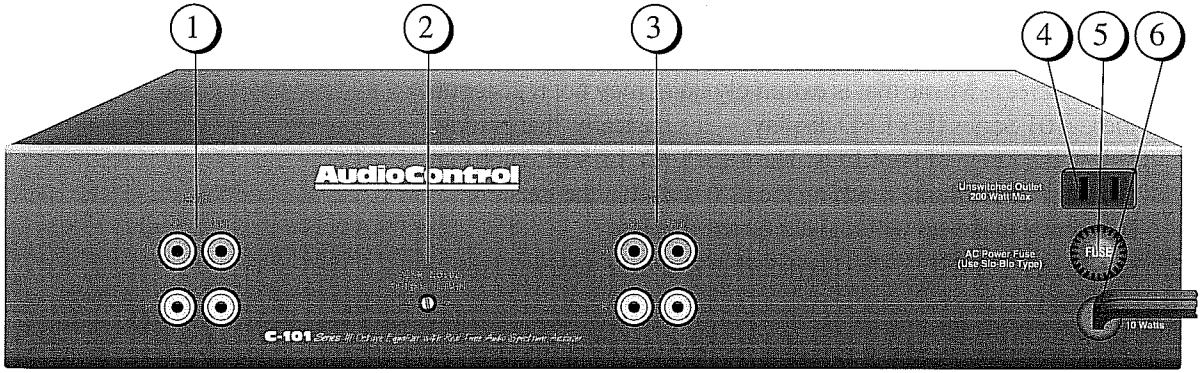
## B. REAR PANEL

**MAIN inputs and outputs (1)** connect the C-101 Series III to one of the Tape Monitor loops on your receiver or preamplifier.

**PINK NOISE OUTPUT LEVEL (2)** controls the loudness of the pink noise generated by the C-101's precision internal generator. In most cases, you won't need to adjust this control at all.

**TAPE inputs and outputs (3)** are used to create another tape loop, so that a cassette deck or other signal processors can be added after the C-101.

**UNSWITCHED OUTLET (4).** If you have even a modest stereo system, you probably don't have enough power outlets for all



your equipment. So we provided an extra one on the back of the C-101.

This outlet **is not affected by the C-101's ON/OFF (POWER) Switch**. In other words, as long as the C-101 is plugged in to a live outlet, there will be AC power present at the UNSWITCHED outlet.

Many receivers have SWITCHED convenience outlets on their rear panel. When you turn on the receiver, any components plugged into the SWITCHED outlets are also turned on. Switched outlets are a good place to plug the C-101 (since you only need it when the rest of your system is activated). If you plug the C-101 into a switched outlet, the C-101's extra outlet also becomes switched. That is, it only carries power to another component when the C-101 itself receives power.

*"Music makes one feel so romantic — at least it always got on one's nerves — which is the same thing nowadays."*

*Oscar Wilde*

IMPORTANT: The C-101 Series III's UNSWITCHED outlet has a maximum power rating of 200 watts. This means that you can plug any signal processor, cassette deck, CD player or Kit Kat clock into the receptacle. HOWEVER, you should NOT plug a receiver, integrated amplifier, power amplifier or television into the UNSWITCHED outlet. They simply draw too much power. If there is any question, consult the component's owner's manual to determine how many watts it consumes.

**AC POWER FUSE (5).** In the unlikely event of a short circuit inside the C-101, this fuse provides protection. If the fuse burns out, replace it only with the same type of 250mA, 250-volt fuse (or 125mA, 250-volt fuse if you have a 220-volt model).

**POWER CONNECTION (6).** The C-101 Series III only draws ten watts of power and thus can be connected to a SWITCHED AC outlet of any preamplifier, integrated amplifier or receiver. By the same token, its low power draw (about same as an electric clock), means that you can actually leave it on continuously if you have other equipment that is also left on.

# INSTALLATION: THE LONG VERSION

What follows is a step-by-step guide to integrating the C-101 Series III into your stereo system. If it seems overly intricate, forgive us. We would rather tell you too much than not enough.

First, check your new C-101 for an shipping damage. We pack 'em pretty securely, but it's a vicious world out there and anything can happen twixt Mountlake Terrace, Washington and your dealer's stock room.

## Paperwork

Yes, filling out the Warranty Registration is about as exciting as doing your tax return, but we'd definitely like the card back after you've played around with your C-101 for a while. We DO read each and every incoming card and react to your suggestions. That's how the Series II became the Series III, after all.

NEXT, PUT THE SALES SLIP OR RECEIPT AWAY IN A SAFE PLACE.

Stashing it away is very important. In the unlikely event you'd ever need service, you'll get some pretty blank looks from the store people if you don't have the receipt to prove when and where your C-101 was purchased. Besides, your sales receipt is handy for insurance purposes. Which brings us to the third admonition:

RECORD THE SERIAL NUMBER OF YOUR UNIT. Sure, theft is now the farthest thing from your mind. But, well...things DO happen. And insurance adjusters don't have very big imaginations when you lack any proof you ever owned something.

Last (and this ends the Nagging Responsibility Section), be sure and SAVE THE BOX. It's handy should you ever have to return your equalizer/analyzer for service, need to move long distances or (perish the thought) sell the unit.

## Placement.

Unlike most pieces of hi-fi equipment, you'll want to put the C-101 Series III where it can be easily seen from your listening position. If that's with the rest of your stereo, fine. The C-101's distinctive and attractive styling compliments any brand of components.

If you stack it with other stereo equipment, make sure not to block the ventilation slots on any components. Also avoid placing the C-101 Series III directly over a large power amplifier. They can get pretty hot.

## Power

Unless the C-101 is far-removed from the rest of your hi-fi, the best place to plug it in is a SWITCHED convenience outlet on the back of your receiver or preamplifier.

What? There's already a CD player plugged into that socket? No sweat. That's what the outlet on the back of the C-101 Series III is for. Plug the C-101 into the receiver; then plug the CD player into the C-101. A CD player or cassette deck and the C-101 together don't begin to exceed the wattage rating for a switched outlet on a modern receiver.

***"Our toaster works on either AC or DC., but not on bread. It has two settings — too soon or too late."***

*Sam Levenson*

## Connection Tips

If you're a hi-fi veteran, this may seem repetitive, but some things can never be repeated too many times (just ask our Customer Support Department!).

- Turn off all components before making any connections.
- When making connections, make sure that "left goes to left" and "right goes to right." The obvious and time-honored way to assure this is to assign RED plugs to Right and WHITE, GREY or BLACK to left.
- Whenever possible, keep power cords away from signal cables (i.e. inputs from CD player, cassette deck, etc.) to prevent induced hum. This is especially important for turntable cables that carry very weak signals. Notice that we have placed the C-101's power cord on the extreme right side (when viewed from the back). This helps you bundle all power cords down the right side of your stereo cabinet and all the signal cables down the left.
- Use quality interconnect cables. We're not going to get into the debate about whether $100 interconnects improve the sound of your system. But we know from experience that really,

REALLY cheap connection cables can cause problems. They tend to disconnect inside, causing a loss of signal or hum. In general, use cables of a quality equal to those included with the C-101 for other connections.

## Hooking Up the C-101 —Tape Loop Method

Most receivers and preamplifiers have at least one Tape Monitor loop, consisting of two sets of sockets, IN and OUT. Many receivers have two sets of Tape Monitor loops. A Tape Monitor loop is sort of an electronic detour. A signal is routed out of the receiver to some other component (such as the C-101 or a cassette deck) and then returned to the receiver.

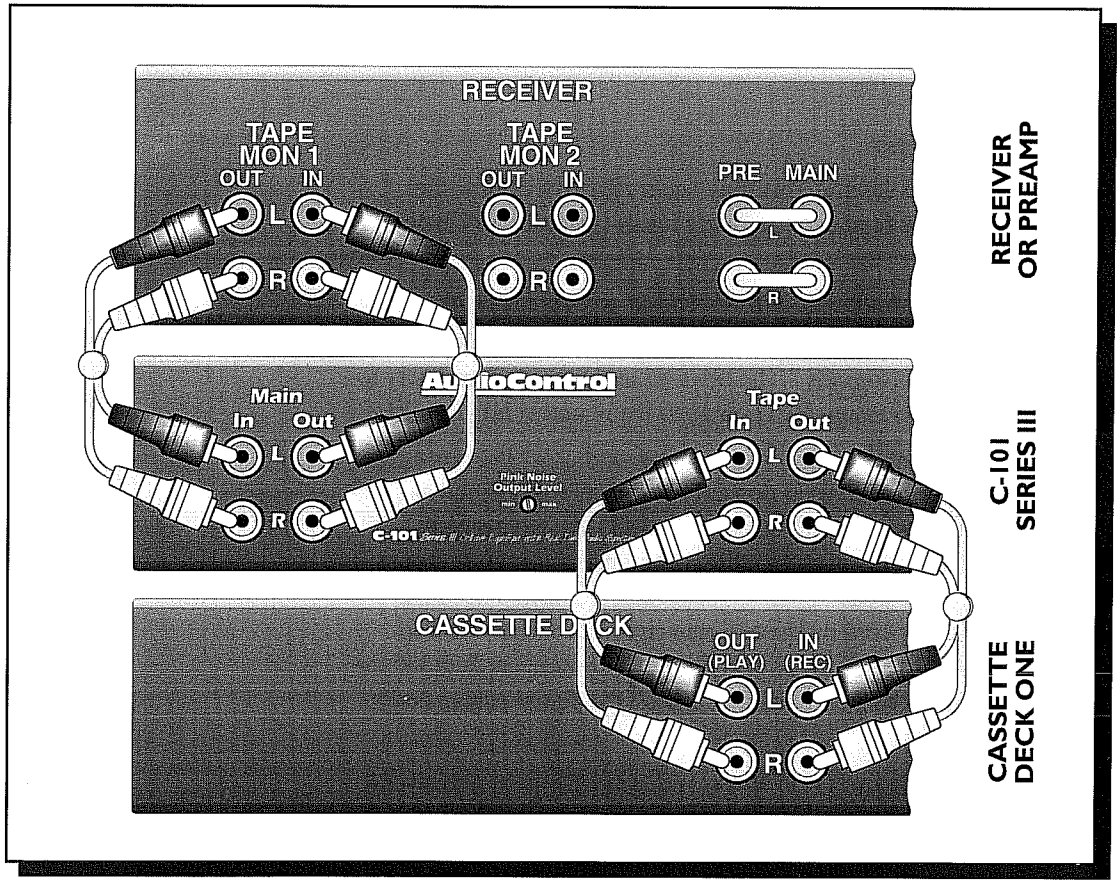
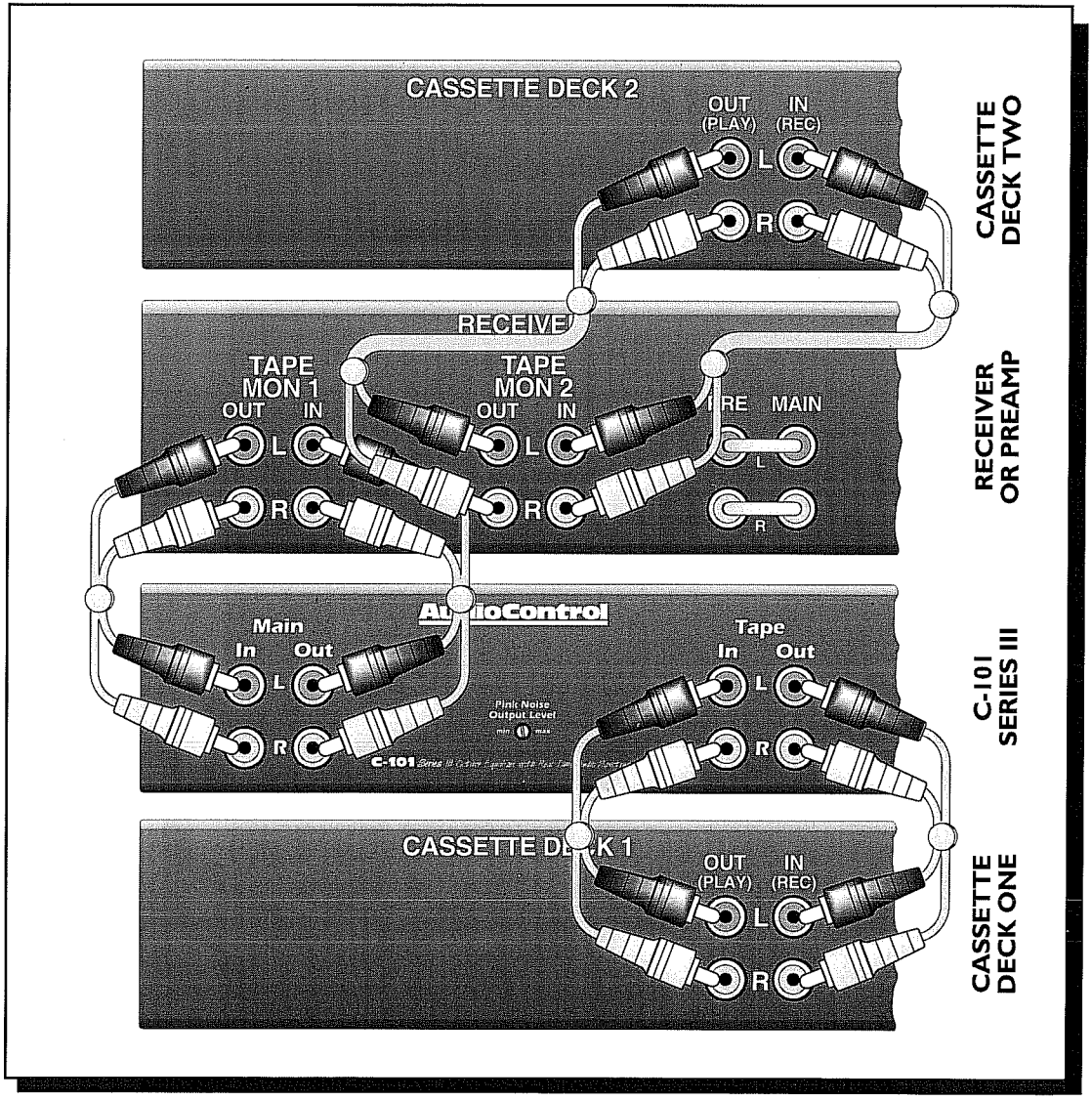



*Figure 5*
*Tape Loop Connection with One Tape Deck*

- If you don't have a cassette deck or only have ONE cassette deck, connect the C-101 as shown in Figure 5.
- If you have two cassette decks, use the hook-up in Figure 6 . This is also an option if you have a cassette deck but don't intend to equalize tapes during recording.

***Figure 6***
*Tape Loop Connection with Two Tape Decks*



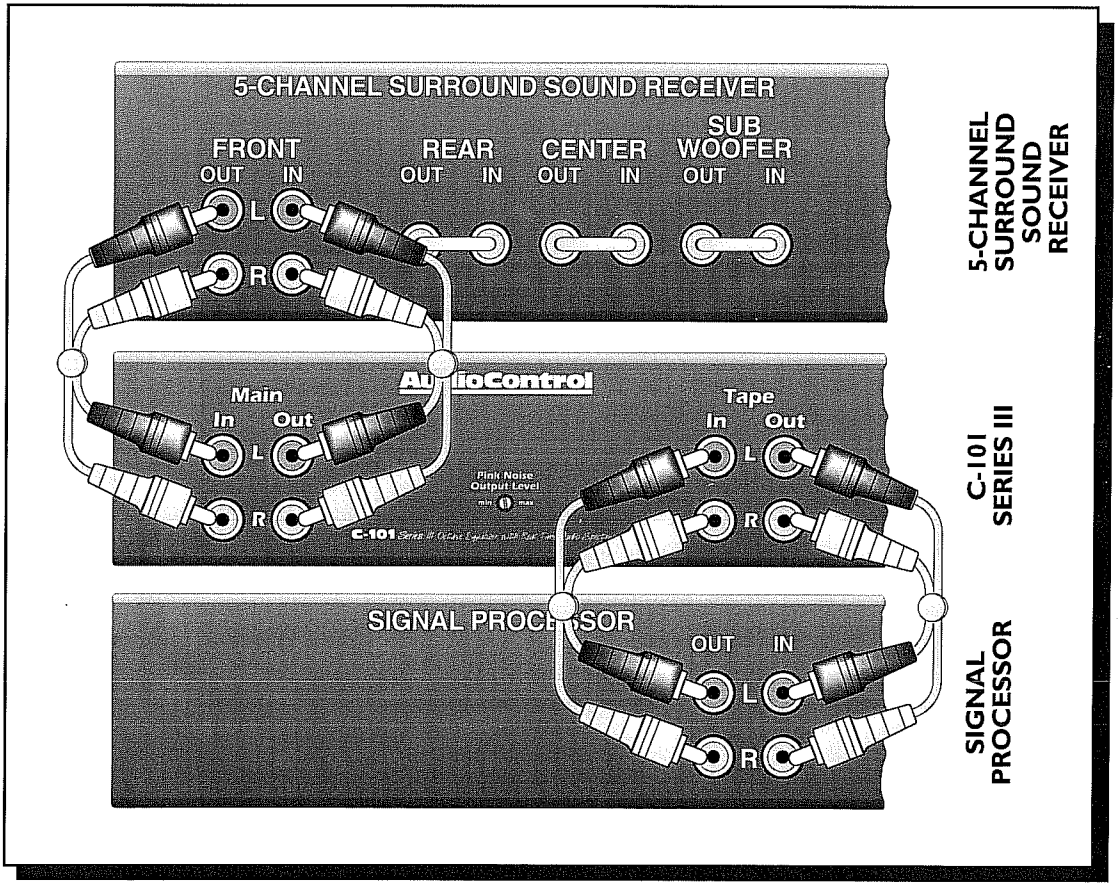
## Hooking Up the C-101 With a Surround Sound Receiver

Figure 7 shows the recommended connection with a Five-Channel A/V Surround Sound Receiver. If you have another signal processor, plug it into the C-101's TAPE connections.

## Hooking Up the C-101 With Multiple Outboard Signal Processors

We recommend placing other signal processors or surround sound decoders JUST AFTER the C-101. The only exception is a dynamic expander which should come BEFORE the C-101.

*Figure 7*
*Connection with Surround Sound Receiver*



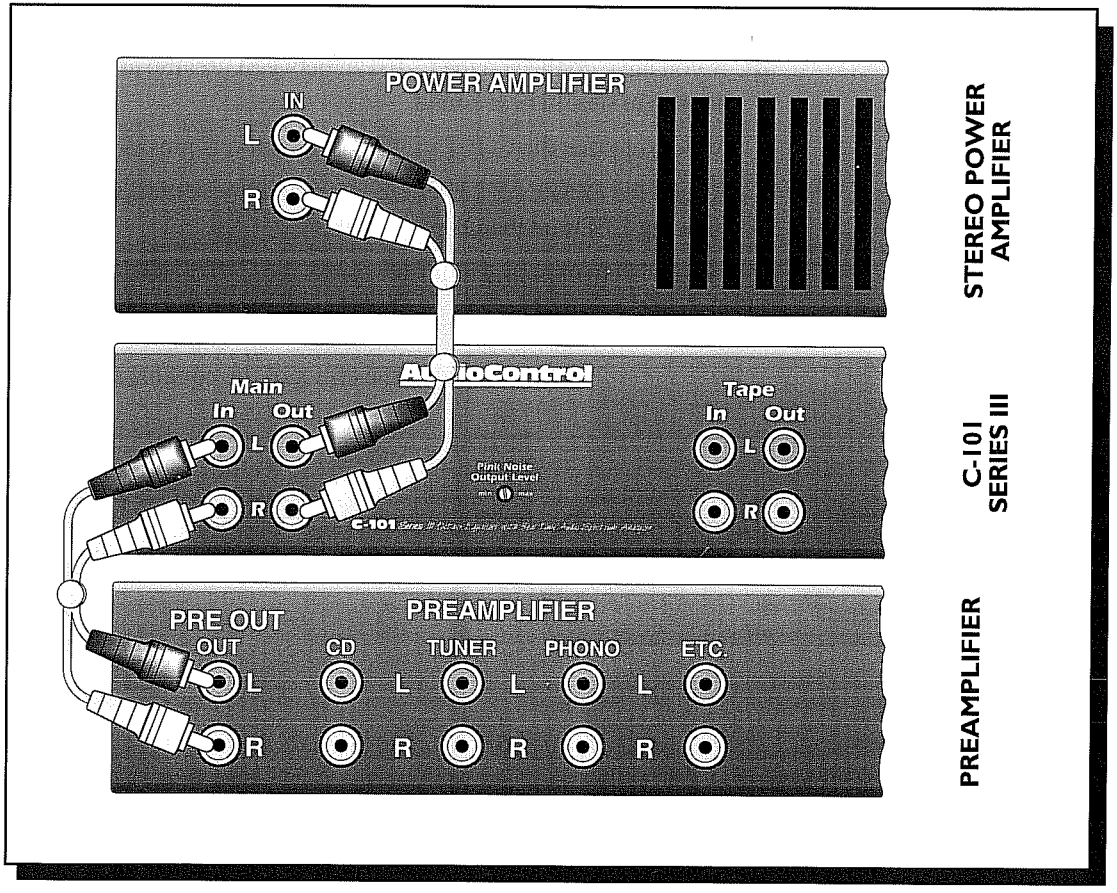
## Hooking Up the C-101 - "Straight Wire" Method

Shown in Figure 8A and 8B (on the next page), this an alternate hook-up which doesn't use a Tape Monitor Loop. It can be used with preamp-power amp combinations or with receivers that have PRE/MAIN connections on their rear panel.

It has two drawbacks: 1) you can't use the C-101 to equalize tape recordings; 2) you must adjust the C-101's DISPLAY LEVEL knob to re-center the display every time you move the preamp or receiver's volume control.

Still, we feel compelled to mention it, since there are a goodly number of esoteric preamplifiers around that consider Tape Monitor loops beneath their dignity.

***Figure 8A***
*Straight wire connection with preamplifier and power amplifier*



## A Shake-Down Cruise

Before moving on to real time analysis, it's a good idea to make sure that you have correctly connected your C-101 Series III to the rest of your stereo system.

1. Turn on your receiver or preamp/amp, C-101 and a sound source such as CD player.
2. Do not activate any Tape Monitor switches, knobs or buttons on the receiver or preamp.
3. Set the preamp/receiver SOURCE to CD and play a favorite CD. Turn the VOLUME control up to moderate volume.

**4A.** If you have connected the C-101 to a Tape Monitor loop, activate the Tape Monitor button or knob. You should continue to hear sound through your speakers.

**4B.** If you have connected the C-101 in between preamp and power amp, you should hear sound.

5. Make sure that the C-101's DISPLAY button is pressed in.
6. Rotate the DISPLAY LEVEL control clockwise until you see dancing LEDs on the Display.
7. If you wish to experiment further, press the C-101 EQUALIZE button and move any group of left/right faders up and down to hear the effect of the equalizer.

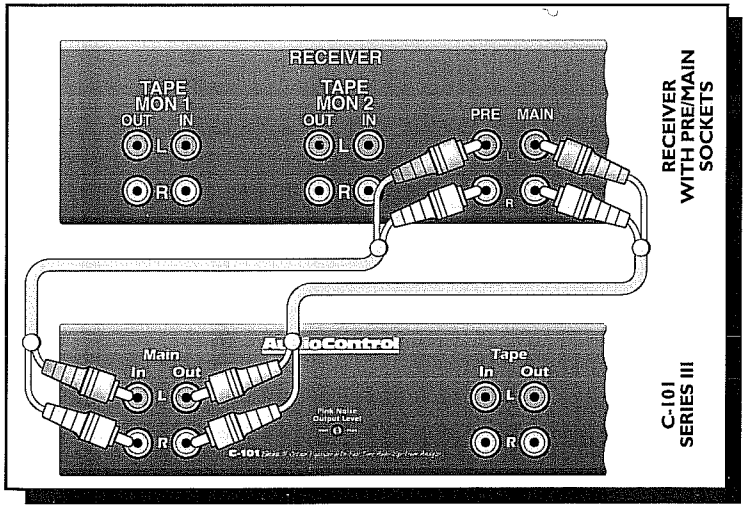



*Figure 8B*
*Straight wire connection with receiver that has pre-main connections, normally bridged by a "U" connector. See previous page for accompanying text.*

# ROOM AND SYSTEM ANALYSIS WITH THE C-101 SERIES III

The C-101's display is more than just a pretty light show. When used with the microphone provided, it is a highly accurate test device that can finally let you see and modify the interaction of your listening room and loudspeakers.

In any scientific measurement, as many variables as possible should be eliminated before the testing process begins. It is also helpful to understand what you are measuring — and what steps can realistically be taken to improve the results.

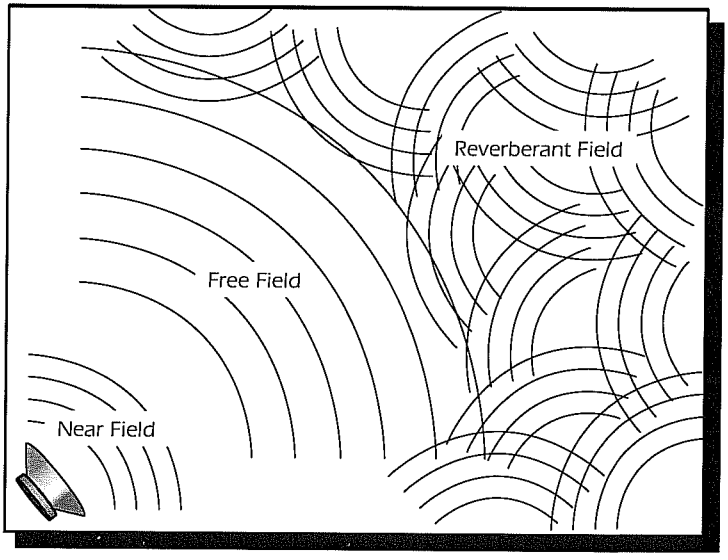
## A Short Introduction to Room Acoustics

Magazine reviewers and owners spend much time critically appraising speakers and other stereo components. Unfortunately, a phenomenon that has a very large effect upon sound is not so easily judged or changed. That effect is the ACOUSTICS of the environment in which you are listening.

Room acoustics is a complicated subject about which entire textbooks have been written. We simply want you to be aware of a few basics that have a direct effect on real time analysis.

Sound is waves, as you probably learned in junior high school. In a stereo system, these waves are created by your loudspeakers. Like waves in a pond created by a splash, sound waves emanate from the transducers in your speakers and spread out into the room. If your room were infinitely big, that's all there would be to it. But just as like waves in a pond reach the bank and reflect back, sound waves bounce off walls, ceiling and floor, reflecting, reinforcing and cancelling each other as shown in Figure 9. Since sound is energy, the way it reflects depends upon the angle of the surface, the type of reflecting material and the frequency of the wave. Because your listening position is

*Figure 9*
*Room interaction: What happens to sound after it leaves a speaker.*



likely to be towards the back of the Free Field waves shown in Fig. 9, you also get part of the reflected Reverberant Field as well.

Now we add the next set of complications: Different frequencies of sound have different wave lengths (a function of the frequency and the speed of sound). Each frequency's wavelength contributes differently to the Free and Reverberant Fields because they are different sizes. For example a 32Hz bass note has a wavelength of 35 FEET, while a 16,000Hz treble note has a wavelength of under a tenth of an inch. Tiny treble waves can be caught and neutralized by draperies, carpeting, upholstered furniture and prides of indolent Persian cats...while gigantic bass waves simply slosh back and forth.

***"Sattinger's Law: It works better if you plug it in."***

*Arthur Block*

Another set of variables is the shape and volume of your listening room. Large rooms require more bass energy to excite waves within them. Small rooms need less energy but reflect it differently. And then there's the fact that most rooms don't have four walls anymore, but open into dining rooms, lofts, cathedral ceilings, etc. All of this means that predicting sound interaction patterns is very difficult due to the irregularities of the room shape.

The final and most important variable is the kind of speakers you have. Are they huge, floorstanding monsters with 15-inch woofers, or modest bookshelf monitors with 6-inch woofers? There are over a thousand models of speakers currently available and each not only has its own characteristic frequency response capabilities, but will behave differently in each listening room! Oh yeah, did we mention speaker placement? Every speaker also behaves differently depending on where it is in a listening room.

As you can see, room acoustics is an important but complicated subject (To learn more about room acoustics, send for AudioControl's **Technical Paper Number 107, *"Small Room Acoustics De-Mythologized"***). The overall point we're trying to make is that your listening room functions as a sort of gigantic mechanical equalizer, boosting or cutting certain frequencies, depending on size, shape, volume, acoustic treatment and position of loudspeakers.

The C-101 Series III will let you see the effects of changes and do something about them. Not all problems can be solved — you can't make a tiny bookshelf speaker shake a huge room with 32Hz

bass. And you can't fully eliminate standing waves or banish the Reverberant Field that threatens to muddy up sound with later arrivals from the rear. But judicious measurement and equalization CAN minimize many problems and make your system sound better than it does now.

## Room Measurement Using Pink Noise

*"Technology has brought meaning to the lives of many technicians."*

*Ed Bluestone*

In a nutshell, the procedure is to play a "perfect" test sound through your speakers, pick it up with a "perfect" microphone and display the resulting frequency response curve on the C-101's real time spectrum analyzer. If the curve isn't "perfect" (i.e. flat), your speakers and listening room are the culprits.

Here are the recommended steps in brief form.

**A.** Analyze with pink noise, Measurement Microphone and C-101.

**B.** Adjust speaker placement and make reasonable changes to room acoustics (see "Speaker Placement" farther on).

**C.** Re-analyze and equalize using C-101 equalizer section.

**D.** Re-adjust to desired listening curve using a familiar musical selection, while incorporating major adjustments from Step C.

**E.** Enjoy.

Now, the long, step-by-step version:

## A. Initial Room Measurement Using Pink Noise

☐ **1.** Turn on your receiver or preamp/amp and the C-101 Series III.

☐ **2.** Make sure that the VOLUME control on your receiver or preamplifier is turned down to about 8 o'clock.

☐ **3.** Set the BALANCE control to the center.

☐ **4.** Make sure that all tone controls are set to neutral and that the LOUDNESS button is not pushed in.

☐ **5.** Press the PINK NOISE button on the C-101. You should hear the characteristic rushing sound created by pink noise.

☐ **6.** Set the C-101 DISPLAY LEVEL knob at 12 o'clock (straight up).

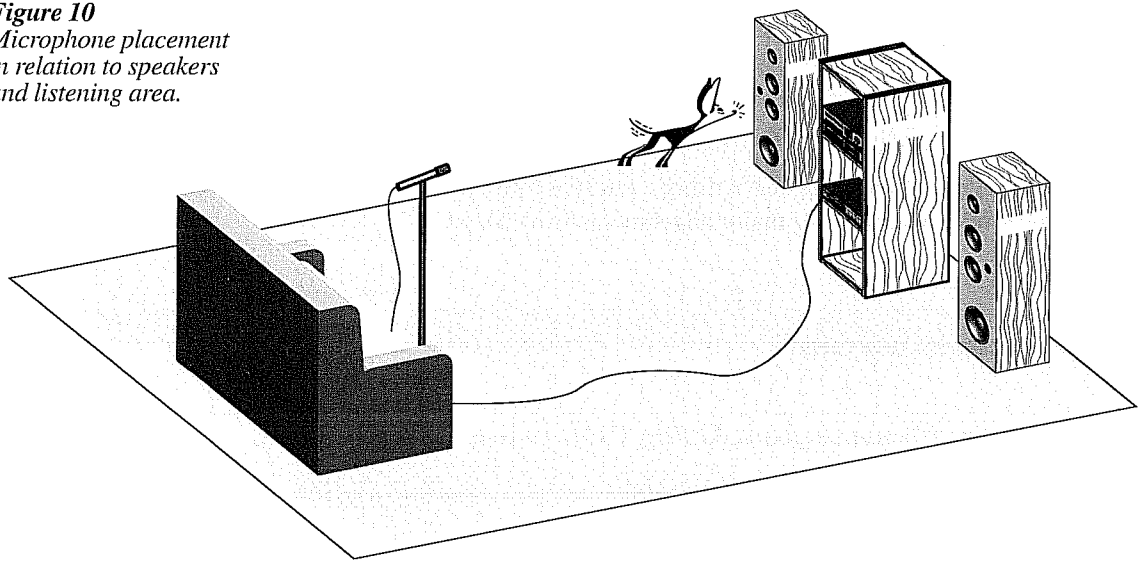
☐ **7.** Press the C-101 2dB / 4dB button IN so that the display reads 4dB increments. This is the "wide angle" view.

☐ **8.** Make sure that the C-101's EQUALIZE button is set to the OUT position.

☐ **9.** Plug the AudioControl Measurement Microphone jack into the MIC input on the front of the C-101. Unfurl the cord and move the Microphone towards your listening position.

☐ **10.** Place the Measurement Microphone in your normal listening position so that it is parallel with the floor and pointing at a space directly between your speakers (see Figure 10).

***Figure 10***
*Microphone placement in relation to speakers and listening area.*



☐ **12.** While holding the microphone, have someone turn up the receiver/preamp VOLUME until the pink noise is loud enough to register across the center row of amber LEDs on the C-101 display. If the pink noise is still faint even with the VOLUME all the way up, adjust the rear panel PINK NOISE OUTPUT LEVEL control until it gets loud enough

when the VOLUME is halfway up. You'll notice that the display is not a flat line nestled in between the amber LEDs. Rather, it is likely to be irregular and will waver up and down in places. This is normal.

☐ **13.** Move the microphone around your selected listening position in about a one foot cube while watching the real time spectrum analyzer display. If the display varies wildly, you've discovered a Weird Acoustic Anomaly. In this case, move your listening position slightly until the display settles down when you move around the foot cube. See? You've already created an instant improvement in your system!

When measuring, keep any reflecting surfaces away from the microphone. This includes your body if you are hand-holding the microphone.

☐ **14.** Secure the Measurement Microphone in the listening position. It should be in an open space at least three feet across. The best placement is a microphone stand. A couple pieces of wood and rubber bands will also work in a pinch. Do not place the microphone on a sofa or pillow as this will soak up high frequencies.

☐ **15.** Back at the C-101, view the results on the C-101 display. More than likely, there will be some fairly ugly peaks and dips.

***"An unalterable and unquestioned law of the musical world is that the German text of French operas sung by Swedish artists should be translated into Italian for the clear understanding of English speaking audiences."***

*Edith Wharton*

## B. Speaker Placement

Rather than immediately sliding equalizer sliders to flatten the response curve, we suggest that you experiment with speaker positioning if possible.

☐ **16.** First, turn off the pink noise. It's probably getting pretty oppressive by now.

Every speaker designer we have ever talked with cannot overemphasize the importance of proper speaker placement. Start by consulting the owner's manual that came with your loudspeakers. Then do not be afraid to experiment. Not only can you hear the differences as result of your experiments but you will be able to see them using pink noise and the C-101 Series III.

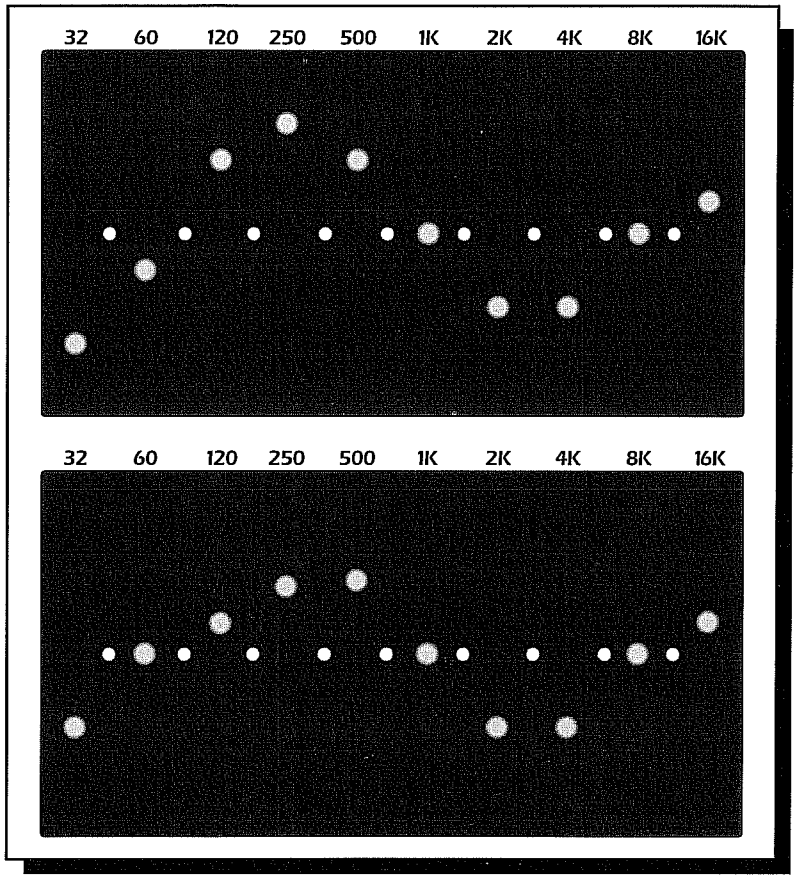



***Figure 11A & 11B***
*11A: A hypothetical loudspeaker pushed into a corner. Note boosted bass at 120 and 250Hz, and dip at 60Hz. 11B shows smoothing (without use of equalizer) achieved by moving the speaker farther out from the corner.*

Make sure you set the level controls on the speakers for best response, then move them around. Pull them out from the wall, move them closer together, and then move them farther apart. You will be astonished at the variation in response that different placements may make. The more you experiment and see the results on the C-101, the more you will learn.

In general, changing the elevation of the speakers above the floor often helps peaky bass response. Anemic bass response can often be helped by using corner or floor placement.

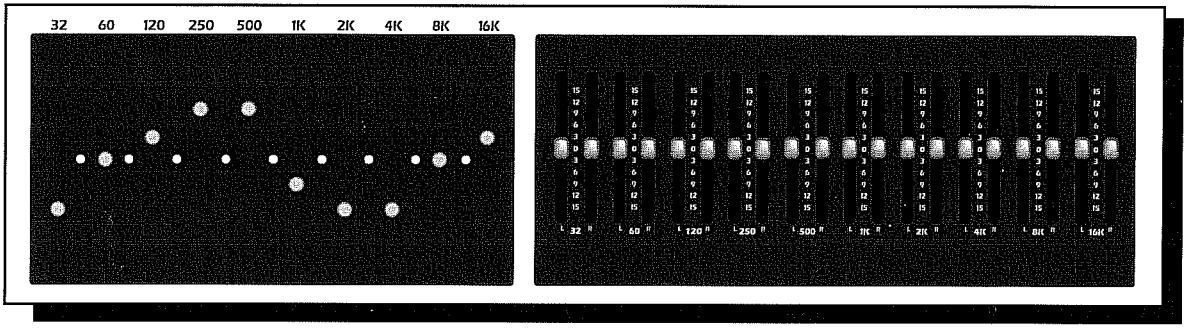
☐ **17.** As you move your speakers around, engage the PINK NOISE button again occasionally, and then evaluate the results. Any speaker placement adjustment that flattens the response curve (and doesn't totally screw up your room decor) is beneficial. A hypothetical example is shown in Figure 11. It shows 3-way 10-inch floorstanding speakers that had been jammed into the corners of the room, resulting in a large peak at 120Hz. By moving the speakers a foot out into the room, the peak was eliminated without having to resort to equalization.

## C. Re-Analysis and Equalizer Adjustment

☐ **18.** IMPORTANT: Turn your preamp or receiver's BALANCE control all the way to the LEFT.

☐ **19.** Press the PINK NOISE button and watch the analyzer display. Adjust the voume if necessary to move the irregular line of red LEDs close to the amber center line (Figure 12).

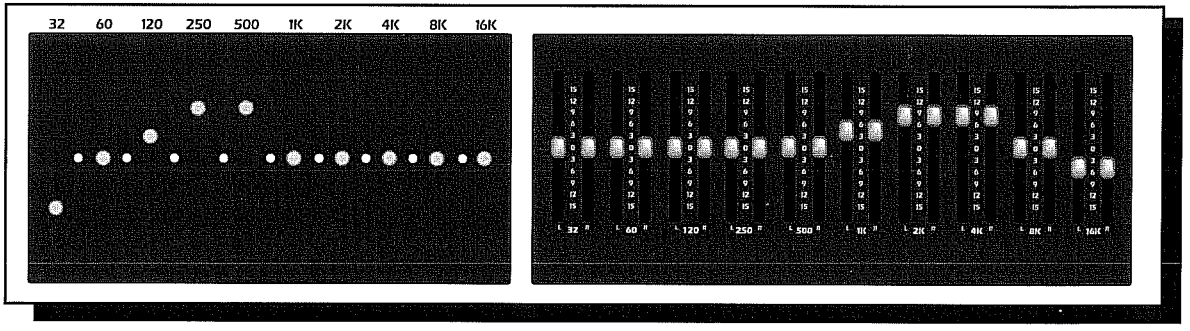
***Figure 12***
*Display and sliders before adjustments (hypothetical example).*




☐ **20.** Press the C-101 EQUALIZE button to its IN position.

☐ **21.** Use the C-101 equalizer to make any adjustments with the left 1K, 2K, 4K, 8K, and 16K sliders. Start by *reducing* the octaves with *too much* output by sliding the proper slider downward. Next, *boost* the ranges that do not show enough output -usually the 16K and/or 8K bands. Don't worry about the *right-hand* 1K through 16K sliders nor bands below 1K.

***Figure 13***
*Display and sliders after left/right treble adjustments (this is a hypothetical example. Things will probably look different when you analyze your own room.*




☐ **22.** Set the 2dB/4dB button to the 2dB (out) position and fine-tune your l*eft-hand* 1K, 2K, 4K, 8K and 16K adjustments to get the LED display as flat as possible (Figure 13 above).

☐ **23.** IMPORTANT: Rotate the receiver/preamp BALANCE control all the way to the RIGHT.

☐ **24.** Repeat Steps 17 and 18 for the right speaker, using the RIGHT 1K, 2K, 4K, 8K and 16K C-101 equalizer sliders.

☐ **25.** IMPORTANT: Move the receiver/preamp BALANCE control to CENTER.

☐ **26.** Adjust both the LEFT and RIGHT 32, 60, 120, 250, and 500 equalizer sliders to flatten the lower octaves of your speaker's response (Figure 14).

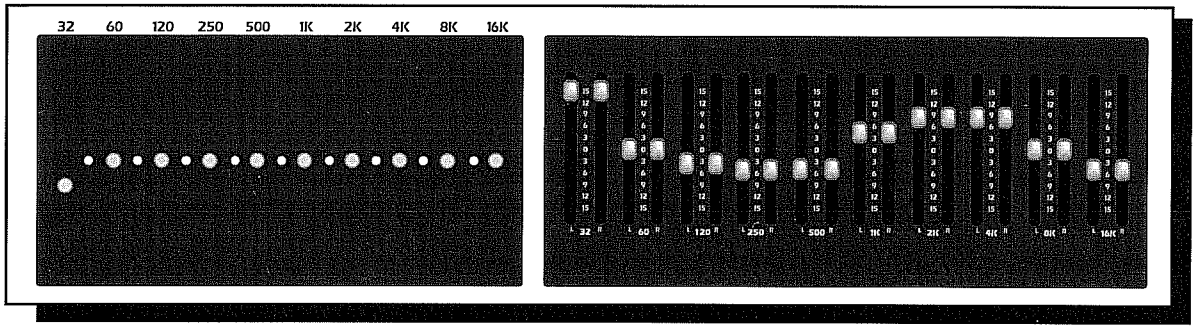



***Figure 14***
*Display and slider positions after response analysis and compensation.*

Even a +15dB boost at 32 or 60Hz may not flatten the response curve if you have small speakers and/or a very large room. Only so much is possible within the design constraints of your particular system. Our example in Figure 14 shows the realistic results of equalizing an 8-inch 2-way system in a 15'x 20' living room. It is NOT flat down to 32Hz! Only larger speakers, an add-on subwoofer or a broom-closet sized listening room would provide a flatter curve.

## D. Final Adjustment and Listening Test

☐ **27.** Turn off PINK NOISE and play a compact disc or record that has wide frequency response. Make sure that the C-101's EQUALIZE button is still pressed in. Also, leave the Measurement Microphone in place.

You may be surprised at what you hear. Although the response curve is far flatter now, the sound may actually sound

harsh and strident. You've just learned something important about psychoacoustics: The human ear doesn't particularly like flat response. That doesn't mean all of your efforts have been for nothing. Everything you did to eliminate bumps and dips caused by speaker deficiencies and room acoustics will be useful. It just means that you need one final adjustment.

☐ **28.** Turn PINK NOISE back on and adjust the equalizer so that the display resembles Figure 15. Your slider positions, of course, will be different than those shown, but the idea is to

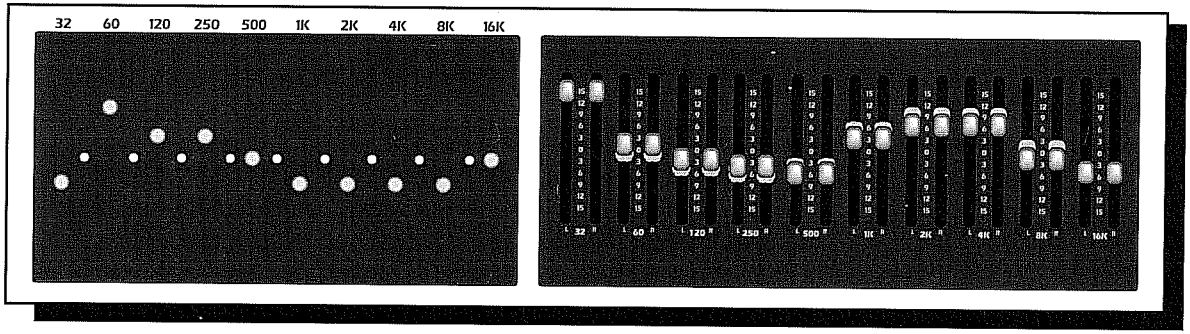



***Figure 15***
*Creating a "house curve" to add more bass. Naturally, your slider positions (like your mileage) will vary.*

"tilt" the response display so that it is higher in the bass areas and lower in the treble. This is a "house curve." It got that name because sound engineers discovered that it was the most pleasing EQ curve for use in auditoriums and concert halls. It provides more bass than treble and midrange.

☐ **29.** Turn PINK NOISE off and listen to that musical recording again. Compare your final equalization settings with no EQ by toggling the EQUALIZE button in and out. We hope that you are impressed with the difference.

If the sound still isn't quite to your liking (for example, still too harsh in the midrange), adjust the equalizer section of the C-101 Series III until you are happy with the results.

At this point, write down the Master Settings for each C-101 slider, so that they can be reset. Not only will you change them to equalize tapes and program materials, but you'll discover that an equalizer attracts inquisitive fingers, which invariably leaves the sliders askew.

### Repeat When Necessary?

Now you have successfully integrated your loudspeakers into their room environment. You don't have to go through this process again unless

**1)** You move your speakers within the room.
**2)** You move your speakers to another listening room.
**3)** You purchase new loudspeakers.

# USING THE C-101 SERIES III AS AN EQUALIZER

## The Pitfalls of Tape Monitor Buttons

When connected in the Tape Monitor loop of a receiver or preamplifier, the C-101 only operates when the appropriate Tape Monitor button is pressed.

The pitfall comes if you have other signal processors connected between your receiver and the C-101. For example, if you have an external surround sound processor, *its* Tape Monitor button must be pressed also. That way the signal can loop out of the processor and through the C-101.

## Operating Your Tape Deck

If you used the hook-up shown in Figure 5, your cassette deck is now connected to the C-101 Series III, instead of your receiver or preamplifier.

To use your tape deck, press the TAPE MONITOR button on the C-101 before playing the cassette deck.

To custom-equalize a tape, simply press the EQ RECORDING button.

One good application for tape equalization is when transcribing older records to tape. You can compensate for the poor bass and over-abundant midrange found in many Sixties recordings.

Appendix A in this manual also covers custom equalization of tapes for your autosound system.

## Creative Uses

If you've just adjusted the C-101's equalizer section to compensate for speaker and room problems, you may not want to re-adjust it. But you're missing a lot of creative uses for equalization.

If you read audio publications or talk to stereo salespersons, you've heard about the quest for *Musical Fidelity*, *Flatness* and *Closeness to Musical Truth.* You may get the impression that the Brain Police will batter down your door and arrest you if you dare fiddle around with tone and equalization.

**Not true**!

No recording is "correct" as you hear it. It has simply been equalized *the way the producer or artist desired* — and for the monitor speakers used during mixdown. Recording studios have four to six-band parametric equalizers on every channel of their mixing boards, outboard octave and 1/3-octave graphic equalizers lurking in their equipment racks. Then, as a CD master is prepared, a mastering engineer adds even more equalization to "balance" the various songs so that they have similar tonal characteristics.

In other words, *recorded music is NOT the Musical Truth.* Just somebody's idea of creative equalization.

Just so that we're not lynched by a band of rabid audiophiles, we need to interject that Musical Truth is, however, a wonderful (though elusive) concept for loudspeaker designers to chase. This is where the buck stops in the audio signal chain. The better a speaker can reproduce equalized sound, the more accurate it will be. And, naturally, we encourage you to analyze your listening room with the C-101 to eliminate acoustic barriers to this Mythical Musical Truth.

But then, when you've cleaned the "smudges" off your system's "sound canvas", it's time to add some strokes of your own.

Because, in your own listening room, *YOUR musical tastes are what counts.*

If you like tons of bass, order some up.

If a vocal is indistinct, enhance it.

If you just want to fiddle around, fiddle around!

That's what the recording producer and engineer did. And now it's your turn as well.

***"When in doubt, make a fool of yourself. There is a microscopically thin line between being brilliantly creative and acting like the most gigantic idiot. So what the heck! Make the leap."***

*Cynthia Heimel*

## Interaction with Previous Settings

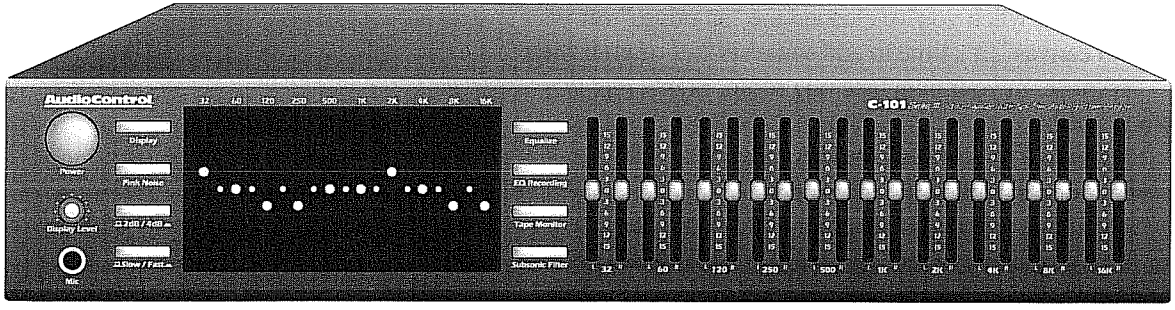
The process of real time analysis and compensation yields a distinctive curve on the C-101 equalizer. It represents your efforts to correct for speaker and room problems.

Therefore, any arbitrary boosts or cuts that you make while listening to a particular album should be added or subtracted from your Master Settings. When you're through adding tonal touches to an album, re-set the equalizer section of the C-101 Series III to your original post-analysis settings (This why we suggest that your mark the settings or write them down for reference).

On the other hand, if you are equalizing a tape, set all of the C-101 equalizers sliders to 0 before you begin your recording. By "transcribing" custom equalization to a cassette via the C-101's EQ RECORDING feature, you can permanently capture these settings. Then when you return the sliders to the Master Settings (which compensate for speaker and room problems) you'll get the benefit of both equalization settings.

## Chances Are, Nobody Will Ever Read This Subhead

Thus concludes the main C-101 Series III Manual. If you have slogged through this much, we salute you. Most manuals just die a lonely death in the packing box. Should you be a real glutton for AudioControls CrackerBarrel-Style Rainforest Writing, we have included several Appendix that cover various specialized topics. Go ahead...you got this far without falling asleep!



# APPENDIX A: CUSTOM-EQUALIZING CAR TAPES

If you'll excuse the pun, cassette tapes can be graphically improved with your equalizer. You can also add zip to CDR® tapes, MiniDiscs® and recordable CDs, if you're really out there on the leading ednge. In a car, different acoustic properties are encountered and speakers are considerably more limited in their frequency response. So your equalizer can help make complicated tonal adjustments not possible with the crude controls found on most car decks.

Naturally at this point, we'd like to make a plug for some really sophisticated car equalizers that AudioControl just happens to make. The EQX and EQL allow precise adjustment of half-octave bass bands and octave midrange and treble bands. The EQT actually provides 1/3-octave equalization, or THREE TIMES as many bands as the home C-101.

But if your car stereo system doesn't have an AudioControl Performance Match™ equalizer yet, there are still ways to "trick" a tape into making your existing system rock and roll.

Figures 16A, 16B and 16C show three C-101 equalizer settings that are good starting points. Make sure that the C-101's EQ RECORDING button is pressed while making your tape. And by all means, experiment. Every car system is different and the three settings shown are only suggestions.

The following is the basis of our suggested curves:

*32Hz.* Unless you have humungous woofers and hundreds of watts of power, you should reduce this frequency. Car speakers usually can't handle this low sound and putting it on the tape invites saturation at a lower volume point anyway.

*60Hz.* Add some, since this is the really good bass area, but remember, car speakers don't go this low too easily and will draw enormous amounts of power doing so.

*120 and 250Hz.* Here's a case where these frequencies can be cut for good effect. The small speakers drivers used in many factory autosound systems resonate in this frequency range, causing an

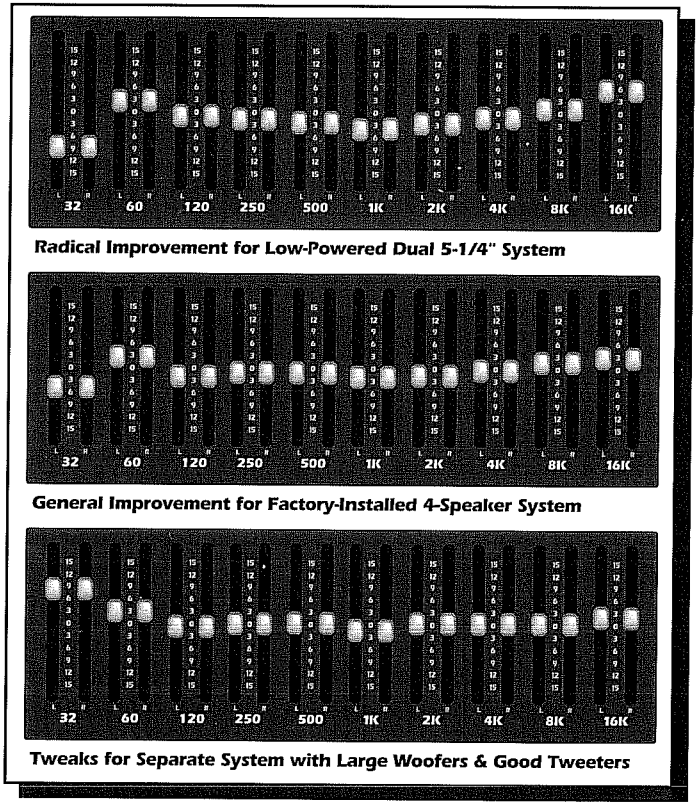



***Figure 16***
*Starting points for custom-equalized car tapes.*

over-abundance of bonkyness.

*Midrange (500Hz, 1K, 2K, 4K).* These frequencies also usually need reduction, especially if you play your car system loud.

*8K and 16K.* While most car speakers put out sufficient 8K highs, almost none do justice to the crisp, tingling, zingy highs at 16K. Boosting these highs NOW, instead of with the "tone control" on the deck means you are only boosting musical highs, not tape hiss highs.

***"For most rockers, the only thing standing between them and total illiteracy is the need to get through their Mercedes-Benz owner's manuals."***

*Gary Trudeau*

## APPENDIX B: HOW TO USE THE C-101 SERIES III TO GET THE MOST OUT OF A TAPE FORMULATION

Many cassette decks include a BIAS control. Theoretically, it can be used to finetune the deck to various tape formulations (and there's a million of 'em out there). When adjusted correctly, a BIAS control can significantly improve the treble response of a particular tape formulation. Unfortunately, tape manufacturers provide no way of determining just how to set any given cassette deck's BIAS. So you probably left the control set where it was when you opened the box.

Now you have a way to actually *use* the BIAS control.

☐ **1.** Set the C-101 as follows:
- DISPLAY on
- 2dB/ 4dB button set at 4dB (in)
- SLOW / FAST set to FAST (in),
- EQUALIZE is OFF (out position)
- EQ RECORDING is IN
- TAPE MONITOR is in
- PINK NOISE button is in

☐ **2.** Put the cassette deck into RECORD/PAUSE and adjust the RECORDING LEVEL to monitor the pink noise fed by the C-101. Adjust the deck's input level controls until the meter reads -20 VU.

☐ **3.** Set the deck's tape counter to 0.

☐ **4.** With the cassette deck's BIAS knob turned counter clockwise, record a segment of pink noise.

When the tape counter reads 20, turn the BIAS knob up one increment.

When the tape counter reads 30, turn the knob up one more increment. Repeat at 40, 50, 60 etc. until the BIAS knob is fully clockwise.

☐ **5.** Stop the cassette deck and rewind the tape.

☐ **6.** Turn off PINK NOISE.

☐ **7.** Press PLAY on the cassette deck and watch the C-101's spectrum display while noting the tape counter. At 10, 20, 30, 40, etc., the last three or four LED bars on the C-101 should change. One of the BIAS settings will provide the best treble response for that brand and length of tape.

That's the setting you should use. It sounds like a lot of work, but if you regularly buy the same brand and length of tape, it's worth the effort to get the best recordings.

## APPENDIX C: GETTING RID OF HISS (ST. PATRICK'S CURVE)

If you trade tapes with friends, or record live music or lectures, you'll probably end up with an occasional tape that has a lot of background hiss. You can't get rid of all of it, because it's mixed with the music or speech...but, some judicious equalizer adjustment can knock out the most obvious parts.

Figures 17A and 17B show two starting points for reducing tape hiss. The upper slider setting is an approximation of a classic curve called the "*A-weighted*" curve. The lower setting is called the *CCIR/ARM* curve (for reasons we won't go into and you wouldn't care about and frankly we're probably not sure of anyway).

Both curves will reduce midrange slightly but should leave the music or voice audible while getting rid of at least *some* of the hiss.

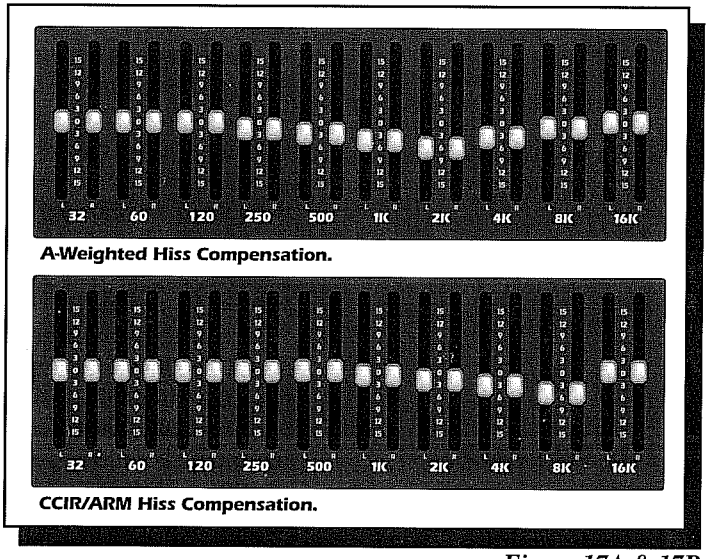



***Figure 17A & 17B***
*Slider settings that can reduce hiss without doing reptilian things to the overall sound.*

## APPENDIX D: THREE HUMBLE PIECES OF CAUTIONARY ADVICE FROM THE OLD STEREOPHILE ON THE MOUNT

***"I always pass on good advice. It is the only thing to do with it. It never has any use to one's self."***

*Oscar Wilde*

### 1. "Be careful of the power you now possess, Grasshopper."

Consider: A 10-inch woofer must slam upwards of a hundred square inches of cone IN and OUT an inch or so, against the pressure of the room air and internal speaker volume...over SIXTY TIMES A SECOND! The speaker's tweeter loafs along moving less than a thousandth of an inch.

So, guess which type of transducer takes up to 80% of your amplifier's power? You guessed it. The woofers. And that's before you arm yourself with a C-101 Series III and start boosting the bass even more.

Let's say you have a 60-watt receiver and a pair of 10-inch / 3-way loudspeakers. Turn the volume knob to the twelve o'clock position and you're probably pushing things somewhat (i.e. momentarily exhausting the amp's power reserves with every loud bass note). Crank the volume control up to five o'clock and chances are, you're gonna blow something up due to the amp's inability to put out enough power.

Now hook the C-101 Series III in, equalize your system, and in the process, discover that your speakers need a generous amount of bass boost at 32 and 60Hz.

Crank the 60-watt receiver's volume control up to twelve o'clock again. The music has more bottom end, but it may also sound more ragged — more like it did when you turned it up too much. It's not the C-101's fault. It's the fact that low bass requires a LOT of amplifier power and is causing your receiver to clip at lower volume levels.

Bottom line: MAKE SURE THAT YOUR AMP CAN TAKE THE EXTRA POWER DEMANDS CAUSED BY BOOSTING THE C-101's LAST THREE OCTAVES. If this means reducing your listening levels somewhat, that may not be as bad as it sounds. Many people turn up their stereo to get more bass. If you can have realistic sound with plenty of deep, tight bass but without extra screechy midrange, why fight it. The other alternative is to get more amp power. Remember, you have to DOUBLE the watts to get a 3dB (audible) increase in volume. So don't go from 60 watts to 100 watts. Jump to 150 to 200 watts. And then make sure you have very forgiving neighbors.

**2. "Use all the weapons at hand, Grasshopper."**

Don't totally stop using your receiver's tone controls. Though not very precise, they're still good for "broad stroke" adjustments on the tonal balance of an album. Often their effect is the same as what you were trying to do by shaping five or six sliders into a curve. Check the specifications section of your amp or receiver's owner's manual for the "turnover" points of the bass and treble controls and how many dB their boost and cut is. Now that you've been working with the C-101, you'll understand better what your old tone controls can and can't do.

**3. "An equalizer should be an instrument of recreation"**

Stay loose. Listening to music is supposed to be fun, not an exercise in fiddling with 20 sliders every time a song comes on.

***"If you're in jazz and more than ten people like you, you're labeled 'commercial.'"***

*Wally Stott*

## APPENDIX E: FOR-WHAT-IT'S-WORTH DEPARTMENT

**1.** Compare a digital recording of, say, Stravinsky's Firebird, with an older analog recording. On the C-101's display, note the difference in dynamics and frequency response.

Play a record, CD or cassette of an album recorded in the mid or early 60's. On the display, note the lack of lower bass (32 & 60Hz and high treble (8000 and 16kHz).

Now that you can "see" sound, terms like "response" and "fidelity" are going to start to make more sense.

**2.** Consider what marvelous children's teaching tool the C-101 Series III makes. Think how much farther you might have gotten into music if you have such a visual window on sound during YOUR inquisitive years. First, it's something your children can watch without "touching daddy's or mommy's stereo."

It's also a great accompaniment to your kid's fave records. (Yes, Barney the Dinosaur's voice DOES does look different on the C-101 display than Kermit the Frog's.) Invest in a sound effect record, too. It's one demo your kids won't yawn through.

**3.** On a related subject...as long as your amp is kept at a relatively low sound level (say nine o'clock on the volume knob), there is VIRTUALLY NOTHING on the C-101 that can't stand the inquisitive touch of an older child. This is one piece of gear that can be exempt from the "Hands-Off-Or-Else" policy. — As long as you remember to return the sliders to their intended positions before doing serious listening

## APPENDIX F: MULTI-AMP BALANCING

If you are bi-amping your system, you will need to adjust the levels of each amplifier in the system before real time analysis. You can do this by ear, in which case you probably will be attempting to compensate for frequency response problems and the particular source material, or you can use the C-101.

☐ **1.** Set the microphone a short distance from that speaker (one meter is the usual distance).

☐ **2.** Play pink noise only through one amplifier (for example, the high frequency side of the system).

☐ **3.** Look at the level on the display. Hopefully, it is pretty flat outside the crossover region.

☐ **4.** Do the same with the other amplifier and adjust so that the amplitude levels are similar at their respective frequency ranges. You need to make these adjustments because most high frequency speakers are more efficient (play louder with the same amount of power) and amplifiers sometimes have different sensitivities to input signals.

☐ **5.** After setting them equal, you can proceed with real time analysis. Be careful about attempting to adjust speaker levels to compensate for other problems (like room acoustics) that are best dealt with via speaker placement and equalization.

***"My father worked for the same firm for twelve years. They fired him. They replaced him with a tiny gadget this big. It does everything that my father does, only it does it better. The depressing thing is my mother ran out and bought one."***

*Woody Allen*

# APPENDIX G: SPECIFICATIONS

***Distortion*** 0.005% THD
***Frequency Response*** From 10Hz to 100kHz ±0.75dB
***Noise*** 118dB (ref. full output)
***Maximum Input*** 8 volts RMS
***Maximum Output*** 8 volts RMS
***Input Impedance*** 100K
***Output Impedance*** 150
***Control Bandwidth ("Q")*** 2.5
***Control Center Points*** 32, 60, 120, 250, 500, 1000, 2000, 4000, 8000, 16,000 hertz
***Control Range*** ±15dB
***Subsonic Filter*** 20Hz, 18dB/octave Tchebychev alignment
***Power Consumption*** 10 watts
***Dimensions*** 17" W x 3.5" H x 11" D
***Weight*** 9 lbs
***Country of Origin*** USA

# APPENDIX H:
# THE AUDIOCONTROL WARRANTY

## An Introduction to the AudioControl Warranty

People are scared of warranties. Lots of fine print. Lots of non-cooperation. Months of waiting around.

Well, don't be scared of this warranty. It's designed to make you rave about us to your friends. It's a warranty that looks out for you and helps you resist the temptation to have your friend "who's good with electronics" try to repair your AudioControl product.

Also, warranties help us keep track of our customers so we can let you know of any modifications, dangers, or improvement. The old factory recall thing. Now, that doesn't mean you are going to get put on a mailing list, and get weird Aztec porno or free deodorant samples. Your name and address on the warranty are strictly confidential to AudioControl.

So go ahead and read through your warranty. Then enjoy your equalizer for a few days before sending in the warranty and any comments.

## CONDITIONAL WARRANTY

"Conditional" doesn't mean anything ominous.

The Federal Trade Commission tells all manufacturers to use the term to indicate certain conditions you have to meet before they'll honor the warranty.

If you honor these conditions, we will warrant all materials and workmanship on your AudioControl C-101 Series III for five years from the date you bought it, and will fix or replace it during that time.

Here are the conditions that make this warranty conditional:

**1.** You have to fill out the warranty card and send it to us within 15 days after you have purchased your AudioControl C-101 Series III.

**2.** You must keep your sales slip or receipt so you have proof of when, and from whom, you bought your equalizer. We're not the only company to require this, so it is a good habit to get into with any hi-fi purchase.

**3.** Your C-101 Series III has to have been originally purchased from an authorized AudioControl dealer. You do not have to be the original owner to take advantage of the five-year warranty, but the date of purchase is still important so be sure to get the sales slop from the original owner.

**4.** You can't let anybody who isn't (a) an authorized AudioControl service center; (b) the AudioControl factory; or (c) someone authorized in writing by us, work on your AudioControl C-101. If anyone other than (a), (b), or (c) messes with it, that voids the warranty.

**5.** The warranty is also NOT in effect if the serial number has been altered or removed, or if the C-101 Series III is used improperly. Now, that sounds like a big loophole, but here's all we mean by it. Unwarranted abuse is (a) physical damage (our consumer products are not meant to prop up bookcases or get hauled around in tool cases, etc. This is a HOME hi-fi unit, not a bash-it-about utility equalizer, so if you crunch it, we can't be responsible); (b) improper connection, patch the phono jack into a line socket or hook it to the speaker terminals on your power amp and we aren't responsible...high input signals could fry the innards; (c) sadistic things you shouldn't do to any electronics, such as get them wet, too hot, dirty, etc.

Assuming you conform to numbers 1 - 5, and it isn't all that hard, we get the option of deciding whether to fix your old unit or give you a new one (See "What to do if you need service").

## Legalese section.

This is the only warranty given by AudioControl. This warranty gives you specific legal rights, and you may also have rights which vary from state to state. Promises of how well your AudioControl product will work are not implied by this warranty. Other than what we've covered in this warranty, we have no obligation, express or implied. Also, we will not be obliged for direct or indirect consequential damage to your system caused by hooking up the AudioControl equalizer.

Failure to send in the properly completed warranty card negates any service claims.

# WHAT TO DO IF YOU NEED SERVICE

First, contact AudioControl. In writing at: 22410 70th Ave. West, Mountlake Terrace, WA 98043 (Attention: Service Department). Or phone us at: (206) 775-8461.

We'll help you make arrangements to have the unit sent back to the factory for service. That means recommending shipping methods and working with you to see if it really *is* broken.

In either case, proof of purchase MUST be included with the unit (that sales slip or receipt we've been harping about). And send a brief note telling us what's wrong with the unit (You'd be surprised how many folks forget this. Then the Service Department has to play an electronic version of Twenty Questions to figure out what, if anything, is malfunctioning. There are a lot of possible combinations of button settings and connections, so help 'em make their lives easier with a note).

You're responsible for freight or postage when sending your unit to the factory. Actually, we recommend UPS (United Parcel Service) emphatically over the Pony Express Postal Service. UPS is more reliable and faster, too.

We'll pay return freight, and practice what we preach about using UPS on the return.

AudioControl®

making good stereo sound better®

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